UNGROUNDING

The Architecture of Genocide

EYAL WEIZMAN

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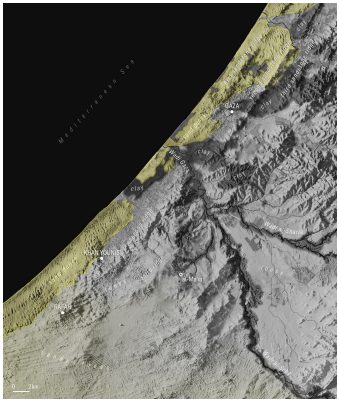
Architecture is politics slowing into form.

An incident is architecture erupting into politics.



An elevation and soil map of the south-western coast of Palestine without borders. Three shallow ridges – ancient fossilised sand dunes – rise parallel to the coastline. The ‘first’ or ‘coastal ridge’ is covered by loose sand (yellow). The ‘second’ or ‘Ali Muntar ridge’ and the ‘third’ or ‘Beit Hanoun ridge’ have fertile loess soil. The shallow ridges are broken by Wadi Gaza and its tributaries, which drain large quantities of fertile alluvials and clay from the Hebron Mountains. The area was largely cultivated with wheat and barley and was Palestine’s breadbasket.

The ploughing of a temporary separation line, around the area that came to be known as the Gaza Strip. The provisionary boundary became the permanent border of the Strip.

Introduction

The Earth-Storm

The Caterpillars have been here for a long time. In August 1950 the area that came to be known as the Gaza Strip was cut off from the rest of Palestine by a ditch carved into the soil by a single-blade plough pulled by a tractor. An archival photograph depicting the scene shows the tractor to be a Second World War-era Caterpillar, model D6.[1] It was part of a convoy of military vehicles. Behind it drove Israeli and Egyptian troops and United Nations truce observers. An Israeli soldier named Amnon Degieli described the scene. 'A jeep with the two sector commanders, the Israeli and the Egyptian, led a convoy of vehicles. The officers held a map at a scale of 1:100,000 on which the border was sketched with a thick pencil line. On the ground the width of the pencil line was one hundred metres.'[2] Entire homesteads and farms fell within it. Mordechai Galili, another soldier who, like Degieli, was a settler from a nearby kibbutz named Nirim, described the process for the settlement's bulletin. He said Israeli and Egyptian troops 'argued over every millimetre…the bargaining was like in a fish market. There were arguments over every tree.'[3] In the scorching August heat, the 'American major' – presumably one of the Colombian UN officers posted to the frontier – 'took off his shirt to sunbathe'. The photograph shows several of the troops lounging in what looks like an abandoned field, while the labour of partitioning Palestine was performed. The 'American' had the last word. 'A signal was given, and the tractor ploughs a straight line right through orchards, vineyards

and wadis.'[4] The ploughing continued segment after segment. In one location, Galili writes, 'the tractor climbs over a cactus fence and parts it with pleasure'. Elsewhere alarmed Palestinian farmers – witnessing the growing trench tearing them away from their lands – surround the vehicles. The Israelis taunt them: 'Take a photograph of this place because you will not see it again.' A Palestinian man shouts that they will soon have their land back and tells the settlers to return where they came from. A desperate farmer pleads with the Egyptian officers to move the line beyond his field. The Egyptians impatiently brush him away. Along another segment, 'an orchard of plum and apricot trees ended up on our side. The owners are on the other side of the line. In front of their eyes we fill our stomachs and pockets, and throw the fruit stone at them, "Eat some!"' The ploughing progressed from north to south. The landscape was rich with fields and orchards. At yet another location, Palestinian farmers realised that the plough was about to cut between two contiguous villages. 'The people in the villages of Abasan and Khiza'a came out in force, screaming, shouting, and yelling.' Women and children gathered around the convoy. The demarcation process was stopped, and the Egyptian army led the convoy away.[5] On this occasion, the Palestinian farmers succeeded in shifting the line. This rare moment of success was recorded years later by Salman Abu Sitta, who on 14 May 1948 – the day the state of Israel was declared, when he was ten years old – had been expelled with his family from their agricultural village of Ma'in Abu Sitta (al-Ma'in) located on a sandstone hill, some three kilometres on the Israeli-controlled side of the plough line and overlooking the towns of Khan Younis, the coastline, and beyond the horizon the Egyptian Sinai Desert. Abu Sitta has become one of the most prolific chroniclers of the ongoing Palestinian Nakba and one of the most forceful advocates for Palestinian return. In February 2025 Salman came to the offices of Forensic Architecture, the London-based research agency I run. Together we worked on a careful digital reconstruction of al-Ma'in – a village whose architecture, agriculture and history are central to this book.

The plough line was not an internationally recognised border but it gave rise to two new and complementary territorial units: the Gaza Strip and the Gaza Envelope. The former was a concentration area for 200,000 refugees expelled from 247 localities, villages and towns and the area's original 80,000 inhabitants; and the latter a frontier zone designed to incarcerate them. The difference between the two sides of the plough line was stark, writes Galili. 'The Egyptian side is dark with Arabs and their herds while the Israeli side is empty.'[6] The administrative region of the 'Envelope' was officially declared only in the early 2000s, as a means of providing the area with Israeli state subsidies, but the term is an apt description of this frontier zone of civilian and military installations that started to be assembled at the same time as the Gaza Strip was formed and designed to enclose it and put it under permanent siege.[7]

Nirim, the kibbutz settlement from which the Israeli soldiers who ploughed the border line arrived, was built on the ruins of al-Ma'in. They fortified behind an enclosure of fences and trenches shaped like a pentagon – a five-centuries-old typology of military fortifications. The settlers dismantled the ruins, and over the years erased most of the remaining traces of al-Ma'in – save for one concrete building and a deep well which they used. The means of erasure was cultivation. The settlers ploughed over all surface elements – buildings, the stone walls between the plots of wheat and barley, the vegetable gardens, the pedestrian routes, the vehicle roads, the agricultural storage facilities, the two buildings that provided the first regional school in the area, and several burial grounds. Ploughing was an act of double erasure, both of what existed and of the traces that any erasure had at all taken place. Soon the fields covered the remnants of al-Ma'in with a dense plume of fresh vegetation. This erasure was meant to transform the land beyond recognition and leave the Palestinian villagers pushed into the coastal area with nothing to return to. The task of Nirim, like other settlements and military bases entrenched around the newly formed Gaza Strip, was to guard the frontier against Palestinian refugees, like members of the Abu

Sitta family, who were trying to return to their lands to salvage possessions, harvest crops or fight the occupiers. The settlers were ordered to shoot-to-kill at anyone – armed or unarmed, man or woman – who crossed the plough line. Nirim, along with the kibbutz settlements of Nir Oz, Magen and Ein HaShlosha, also built on Abu Sitta's land, would be amongst the hardest hit on 7 October 2023.

*

'The Occupation [Army] has changed the Strip's topography beyond recognition,' wrote Palestinian poet Omar Moussa at the end of November 2023.[8] By that time thousands of ground-penetrating bombs had ripped through the subsoil with the seismic force of small earthquakes. They created craters deep enough to swallow entire buildings. Giant armoured bulldozers – now Caterpillar model D9 – stabbed their front blades into the ground and drove forward, flipping fields and shaving off orchards. A Palestinian farmer sent Forensic Architecture a voice memo describing the family farm, which had a vegetable garden and one of the last olive, pomegranate and citrus orchards in the area: 'It is now the same as it was before, desert. I wouldn't be able to recognise it.'[9] After the farms came the outer neighbourhoods of villages, cities and refugee camps. Videos posted by soldiers showed bulldozers felling line after line of homes, tearing through the asphalt of roads and letting raw sewage bleed out of the broken pipes onto the exposed soil. The bulldozers proceeded to turn Gaza's Coca-Cola factory into a landscape of glittering glass.[10] They stopped at nothing, scraping through archaeological sites and cemeteries.[11] 'Our job is to flatten Gaza,' one of the units operating the bulldozers posted on social media.[12] 'Palestinians will have nowhere to return to,' said another Israeli officer, 'all they will find is scorched earth. No houses, no agriculture, no nothing.'[13] Further west towards the coast another soldier marvelled at the vista they opened, 'a momentary view, pure and profound, of

clean nature'.[14] 'If we survive this war,' Omar Moussa quoted a friend asking, 'what would be our meeting point?'[15]

Ungrounding is unlike other kinds of destruction in which the surface markings of inhabited areas – plot lines, roads, fields, gardens, walking paths – remain identifiable. In all other wartime destruction that I have studied, even when buildings collapse, one can still tell where they once stood, and understand something of the social reality that the urban surface held together. After a conflict ends, buildings and neighbourhoods can be extruded from their footprints. Ungrounding, on the other hand, aims to remove a society from its place and erase all traces to its previous existence. It extends from buildings down to the soil beneath them. It is a type of violence that is earth-shaping, terra-forming. Ungrounding is not a by-product of military confrontation but rather its aim. It destroys all conditions that sustain life and produces an empty slate, a *tabula rasa*. The monochrome desert of upturned soil is the material signature of Israel's genocide.[16]

Soil is a composition of multiple elements. Grains of sand have each a different origin – seashells, coral, rocks and minerals – likewise the ungrounded soil of Gaza after October 2023 became a mixture of fragments of all elements that had previously composed urban life – crushed concrete, plaster, plastic, glass, dead plants, sand. Since October 2023, Gaza was not only turned into a demolition zone but also into a construction site. The bulldozers carved a new militarised master plan through the pulverised rubble, like a finger sketch on a dusty windscreen. In this design, rubble mounds became the basic architectural unit, the walls with which every type of structure was made. Bulldozers shuffled right through the rubble to make roads that cut Gaza into separate sections. Along these routes, the bulldozers piled up mounds to enclose fortified compounds, military outposts and detention facilities where Palestinians were interrogated and tortured. The relatively flat topography of the Gaza Strip was gradually transformed into a stormy landscape of artificial dunes that drifted along with the movement of the army. The army turned the surface of the earth into a gelatinous and fluid

medium. Earth-waves rose, receded and settled when the army's priorities changed. The earth storm swallowed people inside. There are estimated to be 11,000 Palestinians missing, many of them in deep craters or under tall mounds of rubble, drowned in earth without a proper burial.[17] Even the markers placed over these grave sites have been swept away in the earth storm. Often, at Forensic Architecture, we seek to identify the location of videos by visible urban markers, but as the genocide proceeded, available markers disappeared and the setting of the videos was nothing but the indistinct and shifting landscape of rubble dunes, making many difficult to locate.

An artificial hill raised close to the Gaza Strip perimeter fence provides the Israeli army with topographical control within this otherwise flat area. An infantry unit can be seen at the crest of the hill. Ammar Awad, 2024.

Much of the ungrounding occurs in areas that the army refers to as a 'buffer zone' all along Gaza's fences. Throughout the past two years the buffer zone expanded until it covered almost all of the territory of the Strip. This ungrounded area is forbidden for Palestinians to return to. The army regarded it as *shetah hashmada* – an 'annihilation zone' where every Palestinian present could be

shot on sight. In the buffer zone no plant or structure remained. This aims to remove any hiding place and expose Palestinians to fire from military snipers or from armed quadcopter drones that patrol the dune landscape.[18] The ever-growing tide of destruction pushed Palestinians into dense and crowded pockets of land on the coastal sand dunes. The army called these areas 'humanitarian zones', though they are anything but humanitarian, and are better described as 'concentration areas' or concentration camps. Tents were erected on the dunes and on the seashore. When displaced Palestinians ran out of sand, tents were erected among the ruins, on piers extending into the sea, on roads and near garbage dumps. Scattered on the dunes, the surviving population of Gaza was reduced to bare existence, subject to unrelenting hunger and thirst under the ever-present hum of killer drones and bomber jets. Israel wanted Palestinians trapped in these islands either to leave or die, and the exit points were closed. This book was sealed shortly after a ceasefire was declared in October 2025. The ceasefire did not bring an end to Israeli attacks but it froze the situation on the ground, leaving Israel in control of an ungrounded buffer zone extending over 58 per cent of the Strip with Palestinians crowded within the broken cities and tent camps along the coast.

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An important framework for this book is the region's unique environment and geology. Palestine's southern Mediterranean coast, where Gaza is located, is the meeting point between different types of soil. Sand washes in from the sea and piles into dunes that drift eastwards with the winds. Clay drains from the West Bank mountains in the opposite direction with the winter floods. The barren sand meets the fertile soils a few kilometres from the coast. The area's main traffic artery, Salah al-Din Road, one of the region's oldest routes, is stretched along the seam between sand and soil like a giant dam. Sand and clay also interlace below the surface in alternating layers. Though Gaza's

surface is relatively flat, under the surface and soil layers are folded into a sharper topography of ridges and valleys. The landscape includes underground 'lakes', where water accumulates in the form of aquifers, and a 'seashore' at the salt water level. The subsoil also includes manmade structures such as archaeological sites, pipework, rubble infill (from Gaza's multiple episodes of destruction), underground barriers and unexploded munitions. The slope of the subterranean ridges might be steep at places, but the landscape is invisible. Upper layers fill the depressions in lower ones, and there is no skyline to reveal the topography's sharp silhouette. The only way to experience the contours of this landscape is in a tactile way, with the tips of one's fingers. Experienced well and tunnel diggers know how to differentiate between types of soil by their texture, viscosity, moisture and density.

Soil is not only shuffled by the colonisers. The architecture of the tunnels responds to the buried landscape, just like buildings respond to surface topography.[19] Tunnel diggers often move up and down within the sloped clay ridges which offer stability. Boring tunnels through the subsoil, Palestinians followed traditional techniques of excavation that are grounded in well building, and that were further honed after 1967 when resistance to the occupation withdrew to the subsoil as the only part of Palestine left unoccupied. In the decades since, tunnels provided a lifeline to relieve the blockade imposed on the Strip and facilitate the operations of the armed resistance. Tunnels continued to be dug and repaired even after October 2023, the excess soil from newly dug shafts easily blended into the sea of rubble.

Videos posted by the Izz al-Din al-Qassam Brigades, Hamas's military force, show barefoot fighters – no one wears shoes in the humid recesses of the earth – emerging by the army's outposts, firing rockets or guns at Israeli soldiers or attaching explosive charges to armoured vehicles.[20]

The architecture of the tunnels – as Part II will tell – continuously confounded the Israeli army.[21] One of the unintended consequences of Israel's ongoing ungrounding is that

building rubble is spread everywhere across the surface. Knots of twisted iron bars distort the electromagnetic signals of Israel's ground-penetrating radar. While about 80 per cent of the buildings above ground were destroyed or damaged, in the subsoil the proportion seems to be inverted: after close to two years of occupation, almost total destruction and subterranean explosions, Israeli officials claimed that it had been able to destroy only some 20–40 per cent of the tunnels.[22] Though *Ungrounding* is among other things a history of the tunnels, its task is not to map their layout.

Whatever information about tunnels is made public is most often disinformation, exaggerations, underestimations, bravado, psychological warfare, attempts to justify the indiscriminate wanton destruction of the surface, or to explain why after two years of destruction of nearly everything overground much of Hamas's fighting force was still intact. Israeli spokespersons described the tunnels under Gaza as a metro – conjuring an image of an integrated network hundreds of kilometres long extending everywhere under the surface and connecting every tunnel shaft to another.[23] Part II will show that nothing like a metro ever existed. If it did, the entire system would have been exposed with the first discovered shaft. Rather than a single complex structure with a distinct architectural shape the tunneling is an operative principle that allows for concealed navigation between surface and depth. Tunnels bypass and short-circuit the visible logic of the surface but are not a separate domain from it. There is a wide multiplicity of tunnels dug and operated by different organisations and large families. Each has a different task – trade, rocket launch, shelter, attack, concealed manufacture or storage. The image of a metro was meant to justify the total ungrounding of Gaza's lived surface, which was described by this metaphor, as a massive, horizontal human shield.

*

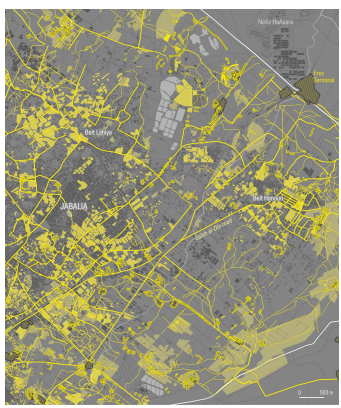
Looking closely at soil and the various agricultural or military

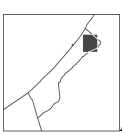
practices related to it – its cultivation, fertilisation, care, contamination, excavation, and piling into artificial landscape – *Ungrounding* offers a longer environmental history of this coastal sliver of Palestine. It seeks to understand the Nakba – a process that started in 1947–8 with the forced expulsion of 750,000 Palestinians by Zionist militias and the Israeli army – not only as an eight-decades long history of displacement and segregation, but also as an ongoing process of land transformation.

Even before 7 October 2023, it would have been hard to imagine the Gaza Strip, with its dense camps and cities, as a natural environment. But the history of the region has always unfolded in relation to its unique and fragile climate, at the threshold of the desert. Gaza is a transition zone between the fertile fields of southern Palestine and Egyptian Sinai. Ever since the beginning of the Nakba, and increasingly since October 2023, Israeli politicians looked to the Sinai Desert as the destination for the expulsion of Palestinians. An environmental marker, the threshold of the desert, has thus turned into an ever-present threat looming on the horizon.

The soil and rubble of the destroyed neighbourhoods of Gaza were piled by Israeli bulldozers into an artificial landscape, used to form all sorts of military installations including outposts, lines of fortifications, checkpoints, detention areas and tank emplacements. Esri World Imagery, 2024–25.

Since October 2023 the one strategic aim of Israel's campaign was the expulsion of Palestinians beyond the desert's threshold to Egypt, but it also tried to move the desert line itself. Ungrounding, as a military form of desertification, unrolled from the Gaza perimeter fences inwards, destroying all conditions that support life wherever the army progressed. Ungrounding primed the territory for development. Different plans for the future of Gaza were all drafted while destruction was still ongoing and by others than Palestinians. Jewish settlers renewed their colonisation plans, the US administration hallucinated Gulf-style beachfront development, and a coalition of Arab states imagined mass housing projects on the *tabula rasa* of Gaza's ungrounded surface. These proposals, each in its own way, threatened to complete the genocide by architectural means.





A new militarised earthwork architecture in northern Gaza. Military routes and tank tracks (thick and thin yellow lines), earth berm outposts (black lines within yellow), military bases (yellow/black hatch) and ungrounded areas (yellow surfaces) were carved through and gradually replaced Palestinian-built fabric (dark grey). Forensic Architecture, 2025.

The book is divided into three parts: 'Soil', 'Subsoil' and 'Ungrounding'. Part I, 'Soil', begins in the period of the British Mandate and extends to the late 1950s. With Ma'in Abu Sitta and Nirim as its focus, it describes the process by which the area from

which Palestinians were expelled turned from Palestine's breadbasket into Israel's main agricultural zone. It tracks the process by which the Gaza Envelope was gradually formed as a territorial enclosure starting with a 'living wall' of agrarian kibbutz settlements. Part II, 'Subsoil', opens with the occupation of 1967 and extends to October 2023. It tracks the history of the tunnels as the shadow of the political history on the surface. Part II adopts the situated experience of users to narrate the history of the area 'from the bottom up'. Part III, 'Ungrounding', describes the gradual formation, since 2023, of the 'architecture of genocide' and shows how the environment became an essential factor in it. From the beginning of the invasion, Israel attempted to expel Palestinians from the rain-rich north part of the Strip – across Wadi Gaza – to the more barren south, and from the fertile soils in the east to the coastal dunes in the west, next to the border with Egypt, where with another push, when opportunity allowed, Israel sought to force them out of Palestine.

*

Ungrounding's chief perspective is architectural. I studied architecture in the 1990s in London, where I still live. Although architectural education usually focuses on design and buildings, I've found myself driven to examine what's been *unbuilt*, what pre-existing life-worlds have been destroyed and erased by architects' impositions. As an Israeli-born Jewish person, I saw this calculated destruction of life-worlds practised with a particular spatial type of violence all around me as I grew up. Though I have left – unwilling to build my life under a regime of Jewish supremacy – I have frequently travelled back to investigate and confront Israel's architecture of settler colonialism. I used my architectural knowledge to document the matrix of settlements, military bases, roads, prisons, checkpoints, buffer zones, fences and walls that added up to a deadly mechanism of spatial separation or apartheid. It was on the architects' drawing boards that the crimes of colonisation were

being committed.

The environment was reconfigured not only by acts of construction, but equally by the designed destruction of Palestinian cities and villages. If the crimes were conceived on the drawing board, architecture was also the means to expose them. In 2010 I set up Forensic Architecture at Goldsmiths, University of London, as an investigative agency that mobilises architectural knowledge and technologies to investigate state violence. The group grew and became international and multidisciplinary and includes now besides architects also software developers, filmmakers, journalists and lawyers, all committed to human rights, spatial justice and decolonisation. Our investigations quickly became much in demand by individuals and communities experiencing state violence around the world.

The 2010s when we began was a time of technological leap. Urban spaces – the most common sites of war – were saturated with cameras and smartphones. Incidents were recorded by all people caught within the web of war, but often at great personal risk. Armies, like Israel's, target journalists and often shoot people pointing their cameras at them. People still took the risk to record and upload videos online, like messages in a bottle, in the hope somebody would look. Often, this was too hopeful. Examining these videos with the utmost attention is Forensic Architecture's way of honouring the risks taken.

Incidents are often recorded by multiple videos. Each offers a unique perspective of what happened but rarely shows events in full. Digital models of buildings or of urban areas provide the means to precisely locate videos in relation to others. The virtual model helps us understand the relation between videos, makes clear what falls inside and outside the frame and how to fill the gap in between. Reconstructions often demand bringing together a multiplicity of video perspectives, together with testimonial accounts and material evidence. The more evidence the model brings together, the stronger the weave of reconstruction.

Videos contain both evidence and testimony. They record not only what takes place in front of the camera, but the

videographer's own experiences while recording the event. In almost every video, we hear those filming also speaking, narrating what they see, shouting at the perpetrators, whispering to people close by, crying, praying or cursing. Sometimes, as we shall see in Part III, the videographer, expecting imminent death, leaves messages to be listened to posthumously. We use testimonies in other ways too. Digital models can also function as memory devices to allow witnesses to recall lost memories and precisely describe their experience while navigating through or building three-dimensional models. 'Situated testimony', a technique developed by Forensic Architecture that I will describe at some length, has been useful in understanding aspects of incidents where no videos exist and in allowing witnesses to have access to memories otherwise obscured by trauma. 'Situated testimony' also allows us to access events that are much farther in the past. We used this technique to reconstruct lost Palestinian villages with survivors of the Nakba in 1948 (as unpacked in Part I) just as we worked with descendants of the genocide survivors of the Nama and Ovaherero people in German South West Africa (today's Namibia, as described in Part III) as well as with survivors of attacks on medical facilities and staff during the Gaza genocide.

The incidents described in *Ungrounding* are not based on a personal experience of the Israeli atrocities afflicted on Gaza these days – for this purpose the reader is better served by the many accounts that Palestinians from Gaza have made available in voice, film and writing, and of all those that will surely be collected over the following years and decades.[24] The accounts of the genocide provided here are rather based on work conducted by Forensic Architecture, whose methods of carefully attending to testimonies and videos allowed my team and me to follow events from London in close to real time.

Some of the work discussed in this book was prepared for courts, particularly for the International Court of Justice (ICJ) in the case of *South Africa v. Israel*, still unfolding in The Hague. We consider this case to be one of the most important in living

memory. However, we are not naive about the relation between law and power and have witnessed the multiple ways in which Israel and the US attempted to undermine not only this case but the entire international legal system for the sake of allowing the genocide to continue. We produced over a thousand pages of reports to the ICJ but record and document atrocities even when there is no court available to achieve justice. Because we cannot rely on the established institutions of justice to act on such evidence, we also present it in different alternative forums. These have included the Gaza Tribunal, cases calling for arms embargo, for the arrest of Israeli soldiers, UN forums, reports, mainstream and alternative media, activist forums, lectures, exhibitions and screenings. Each of these modes and forums enabled my team and me to highlight different dimensions of the same unfolding event. The incidents we investigate might occur at the molecular level of history, but we always treat them as doorways to investigate the wider circumstances, and pull their causal threads into larger historical, territorial and political context. We call this approach 'the long duration of a split second'.

Forensic Architecture's investigative work is not taken from a position of neutrality. Our principle of 'engaged objectivity' makes us take sides, never with the state, and always with those exposed to state violence. We work in collaboration with the individuals and communities at the forefront of the struggle for liberation and seek to present incidents in a way that is led by the experience and knowledge of those individuals and communities.

Rather than being understood as a reflection of the basic principles of human dignity and international law, our commitment to liberation, return and equality for all in Palestine exposes the Forensic Architecture team, me personally, and certainly the evidence that we produce, to accusations of bias. Such accusations are often made by agents and supporters of a state committing grave intergenerational crimes. The debate and struggle around evidence demands however that our research is prepared and presented in as meticulous a way as possible, following a clearly presented methodology and in a way that we

can demonstrate, step by step, how we know what we know and why we say what we say. Having an axe to grind sharpens the quality of our research.

In recent years, Forensic Architecture has evolved into something we call the 'Investigative Commons', with offices run by former members, students and close collaborators in more than a dozen places worldwide including in Colombia, where we worked for the National Truth Commission documenting nearly six decades of internal armed conflict; in Mexico where we worked on the forced disappearances of the forty-three students from Ayotzinapa; in Turkey where we currently work on the killing of journalists and human rights defenders; in Greece where we presented evidence in a trial of the neo-Nazi Golden Dawn which helped get the party banned; in Brazil where we work on cases of racially motivated killings by the state militarised police; and in Ukraine and elsewhere.[25]

Among the earliest of the groups practising forensic architecture (the use of lower case denotes the larger field rather than the name of the agency) outside of London was Al-Haq, the first and largest human rights organisation in Palestine, operating from Ramallah. In 2020, we helped found the Al-Haq Forensic Architecture Unit which has been effective in investigating the crimes of the Israeli occupation. Investigating under occupation is not without consequences. On 22 October 2021 the Israeli Ministry of Defense designated Al-Haq, without evidence, as a terrorist organisation – a designation no other government has accepted.[26] In September 2025, Al-Haq was put under sanctions by the Trump administration for assisting cases against Israel in the International Court of Justice in The Hague. If the committed researchers of Al-Haq are terrorists, then it must be the truth itself that terrorises the oppressor.

Al-Haq has been the target of digital and physical attacks, with its staff under constant risk of arrests and reprisals. Funders, especially in Europe, withheld funding. As a result, anyone working for, collaborating with, or providing services to Al-Haq, including members of the Forensic Architecture team, has also

been subject to potential arrest by the Israeli army or police on charges of terrorism, with little potential remedy.

Less than a year after their designation as terrorists, in the early hours of 18 August 2022, Israeli troops raided the Al-Haq offices as well as those of five other Palestinian civil society organisations that were similarly designated.[27] CCTV footage of the raid showed balaclava-wearing commandos, guns drawn, blowing up the office's front door and rummaging through files and the computer system. The last scene visible in the video is of an officer leaning over to cut the electricity cable.[28] It was the first time we investigated violence perpetrated against our own team but it will not be the last.

When Al-Haq's staff arrived the next morning, they found a metal sheet welded over the door frame, with a sign saying the office was a closed military zone.[29] They prised the welded sheet open, and though their computers had been stolen, the organisation's staff, with the Forensic Architecture unit amongst them, were soon back at work, investigating the targeted killing of Al Jazeera journalist Shireen Abu Akleh at the request of her family. There is a connection between the designation of Al-Haq as a terrorist group and the assassination of Shireen and other journalists and human rights defenders in Palestine. Journalists and human rights defenders are often first to arrive at the sites of atrocities, reaching victims and witnesses and mapping out attacks. This violence against those who investigate Israeli atrocities is part of the regime's attempt to control both facts and their interpretation. There is a direct line between the discrediting of Palestinian testimonies, the destruction of evidence and the intimidation, arrest or killing of witnesses, journalists and human rights activists. These acts make clear that negation is not merely rhetorical, a game of language, statement and counter statement, but a violent physical practice that unfolds in the material world, similar to the way that ungrounding is an act of denial directed against the landscape, a claim that nothing had previously existed.

Philosopher Jean-François Lyotard referred to genocide denial

as an earthquake so strong that it destroys not only the environment but also the instruments designed to record its magnitude.[30] However, as this book will show, Israel's rhetoric after 7 October has included not only acts of denial but also a joyful flaunting of annihilatory violence. Such negation lies at the foundation of the Israeli state. While on the one hand, Israel's official state-sanctioned negation of the Nakba is the foundation for the daily negations of present atrocities, on the other, Israeli spokespersons continuously used the Nakba as a threat.[31]

*

Since 2023, I have felt a cruelly persistent, visceral reaction to the scenes of unimaginable brutality that Forensic Architecture was documenting, even as I've tried to hold things together and keep doing our painstaking work of piecing together accounts of these atrocities. The first weeks of the Gaza genocide pushed our team to its limit. We watched in horror as colleagues we had worked with for years, as friends and family of team members were killed in Gaza. The experience was hardest on Nour Abuzaid, one of my closest colleagues in Forensic Architecture. Nour's family was expelled in 1948 from Ramle and al-Lydd and she was born in al-Bureij Refugee Camp in central Gaza, and made it to London via Sudan, Syria and Turkey.

Early mornings brought bad news. Already in October, an Israeli airstrike killed Nour's close cousin, along with her husband, children and grandchildren. Any little remaining sense of safety Nour still had in the world was shattered, and the fear that death would strike closer to home and claim more of her loved ones was constant. That fear kept being actualised, time and again, as it did for nearly every Gazan we knew.

I witnessed Nour's pain, and that of others. The days after 7 October have been heavy also because people connected to my family were killed in the attack on the Envelope. I had to make room for a tangled emotional terrain of personal grief and political commitment. I shared in the shock of those close to me,

without losing sight of the fact that these feelings were more readily welcomed in a world that seemed then only able to mourn for Israeli civilians while making itself willingly blind to the ever-present Palestinian tragedy. Friends who were most supportive through these days, such as artist Emily Jacir, were Palestinians who had been crassly vilified on social media, harassed, smeared, cancelled and deplatformed (one was arrested and deported from Germany). Emily said it was part of a campaign to erase Palestinians everywhere.[32]

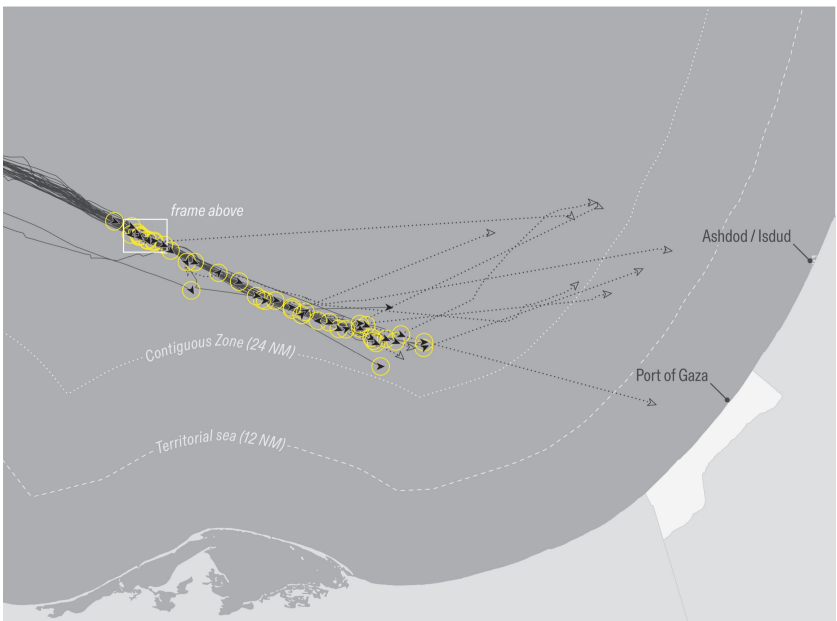
Shortly after 7 October, Rushdi al-Sarraj, a journalist-filmmaker who was the director of Ain Media, Forensic Architecture's close partner organisation in Gaza, reached out to Shourideh Molavi of Forensic Architecture to see if we could help establish what had happened to three other members of Ain Media who had disappeared on 7 October while documenting events as journalists. Our first investigation of the genocide was thus focused on finding our colleagues, who we searched for remotely amongst the flood of videos posted that day.[33] Two weeks later Israel targeted and killed Rushdi in an air strike.[34] A year and a half later, Rushdi's brother, Mahmoud al-Sarraj, who was also working with us until he died, was assassinated along with other colleagues.[35] On 16 April 2025 Fatma Hassona, a twenty-five-year-old Palestinian photojournalist, her pregnant sister and several other relatives were targeted and killed in a strike over their home. Iranian film director Sepideh Farsi, who had just completed a film on Hassona, asked us to study the targeting of her friend. It felt to us like Israel was murdering our own.

Requests for our work came from multiple directions. We worked with the Gaza-based medics of the Palestinian Red Crescent Society to investigate incidents in which their members were assassinated. We worked on legal cases against arms exports to Israel from Germany and the UK.[36] Our work was used in cases brought up by the Hind Rajab Foundation attempting to bring the arrest of Israeli soldiers. We provided evidence in cases where solidarity activists were criminalised, we collaborated with

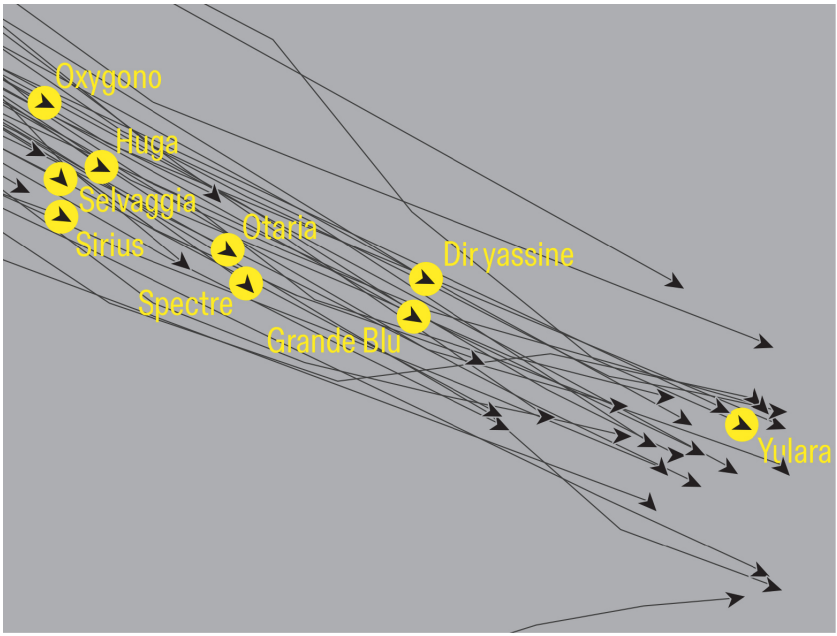
the organisers of the Freedom Flotilla as the humanitarian missions they launched were intercepted by Israel. We worked with medical professionals from different international and local organisations who, after Israel banned the entry of journalists and human rights defenders, were amongst the only ones to report on the atrocities.[37] Throughout these months a community of solidarity was being formed. We were releasing reports at a breakneck speed, trying desperately to throw whatever little sand we had in the gears of Israel's genocidal machine.

We regularly investigate individual incidents and take the time necessary to provide meticulous reconstructions, but since October 2023 the scale of atrocities has been too large. It's been hard not to question the value of our work. What was the point of documenting atrocities when Israel enjoys impunity, when nobody in power seems to care, when the situation on the ground has deteriorated so fast with no relief in sight, when international law and human rights seem to matter so little to the governments of the global north that have kept supplying Israel's army and suppressing demonstrations and activism designed to stop the atrocities? Israel was doing two seemingly contradictory things. It claimed at the same time that its actions were justified and made no efforts to hide its crimes – on the contrary, it openly announced its commitment to the destruction of Gaza and the annihilation of Palestinians, seemingly taking pleasure in its power to transgress every international law, societal convention and moral norm. No reporting, civil protest, or legal process seemed able to slow Israel down. Nour gave me an explanation for why we must continue our work. 'We must watch every video that comes out of Gaza, because others might grow tired or look away. No loss should go undocumented.' We were miles away, safe in London, helpless in the face of the atrocities we were witnessing. Nour said working through videos was her way to stay close to her family in Gaza, where, more than anywhere else, she longed to be, and so that she could, even from afar, begin to understand what they were going through. We were not only watching videos of atrocities but of Palestinians recording their

resistance and perseverance, their daily life under genocide: cooking foraged food over a communal fire fuelled by recycled plastics, or using traditional techniques to dig a new well when water and desalination plants had been destroyed, running schools under the open skies or by the beach, or completing and submitting academic theses to universities whose buildings were already long destroyed – these declarations of life became acts of resistance against a power bent on their total annihilation.



Throughout the genocide Israel illegally intercepted boats belonging to the Freedom Flotilla in international waters (yellow circles show the boats' last known positions). The interception of the forty-two boats in the Global Sumud Flotilla between 1–3 October 2025 when 462 crew members were abducted.



Close up on interceptions on 1–2 October 2025.

Image from *Oxygono*, a vessel in the Global Sumud Flotilla, from 2 October 2025.

Activists and protesters rose up everywhere in the world. Particularly moving to me was seeing a younger generation of Jewish activists committed to Palestine's liberation form an unprecedented solidarity with Palestinians in London, Berlin, New York City and elsewhere. Everywhere the state-sponsored anti-immigration sentiment and openly Islamophobic persecution of activists, artists and intellectuals and rampant anti-Arab and anti-Palestinian racism was justified under the guise of fighting antisemitism. This happened while real antisemites were elected to high office, and in an act of stunning historical inversion, aligning behind Israel's racist policies.[38] Forensic Architecture, and in particular its Berlin-based sister agency Forensis, started to experience cancellations and deplatforming, frequently coming under attack from Israel's supporters.[39] Both organisations

experienced bogus accusations of antisemitism. Our websites have been hacked. Some funders walked away. The Berlin office radically downscaled. A lecture I was scheduled to deliver in the Free University in Berlin in February 2025, together with my friend, UN special rapporteur Francesca Albanese, was cancelled after the Israeli embassy contacted the Berlin mayor who successfully pressured the university to disinvite us.[40] We gave the lecture in an alternative venue surrounded by dozens of police officers, with detention vans parked and waiting outside. Shortly afterwards – perhaps because of this, perhaps for other reasons, the German police won't tell – I was designated a 'person of danger' and am stopped for interrogation every time I enter or exit Germany.

As mentioned above, our largest engagement throughout the genocide has been with South Africa's legal team, producing evidence for the landmark case they brought against Israel in the International Court of Justice in The Hague.[41] In January 2024, the case swept to court on the back of millions of citizens worldwide protesting the genocide. It was empowering to see representatives of the former colonial state that invented the form of racial dispossession known as apartheid standing before judges accusing Israel of genocide and denouncing the entire global north for its military and diplomatic collusion. The court failed to deliver a stop to the genocide, but it amplified the voice of the movement that opposed it and gave credence to the description of the atrocities committed by Israel as 'genocide'. South Africa was threatened with economic consequences, demonstrating the fact that international law is perceived as a threat to the global hegemony of the US and to Israel's ongoing colonial endeavour. It seemed that as well as its campaign to erase Palestine, Israel's task was also to destroy the legal instruments able to render judgement on its Israeli actions.

This book has been written in snatched moments between meetings, in evenings and at weekends, during short and long commutes when the working days were dedicated to Forensic Architecture's ongoing investigations in Gaza and elsewhere in

the world. Writing a longer history attuned to the environment and soil was a way of dealing with the emotional toll that this work exacts. Arranging events in space and along a historical timeline helped me to integrate otherwise disassociated fragments of violent reality that my working days were fully exposed to, and that invasively returned to haunt my nights, into the continuous flow of time.

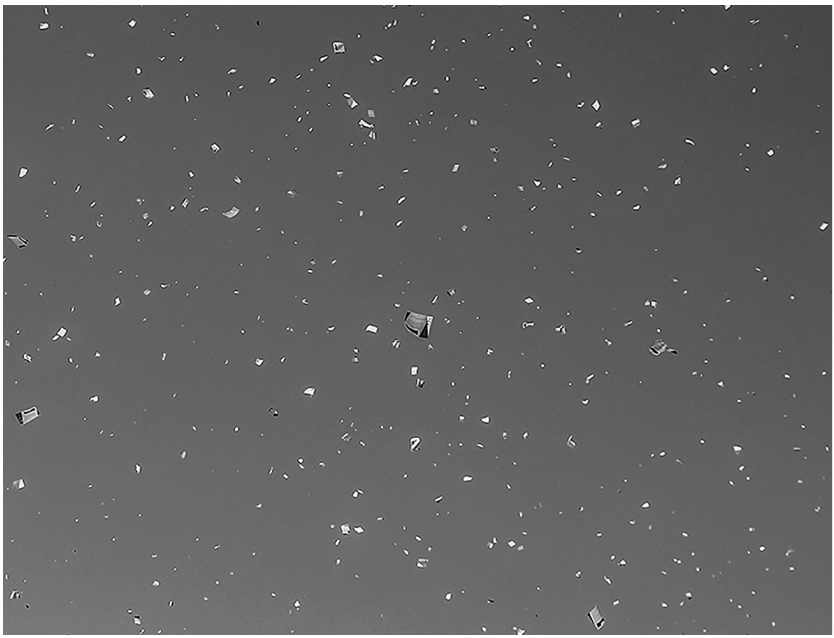
The book includes investigations of violence and displacement from 1948 through to the Gaza genocide. From each of those incidents it pulls out threads that connect to the longer history of the ongoing Nakba. *Ungrounding* thus moves between different scales and durations. It sometimes zooms into specific locations, the people who inhabit them, offering minute description of incidents that erupt in split seconds, and at other times it zooms out to describe accretional processes of environmental and territorial transformations that are so slow as to be almost invisible. These different scales and speeds are continuous and interrelated: incremental processes of environmental destruction can suddenly erupt with the kinetic force of a blast. The accounts are equally based on an analysis of spoken and written testimonies, online videos and old archival documents, on geological studies and soil samples, on Ottoman or European colonial maps, on Second World War-era British aerial images and on contemporary satellite images, on poetry, oral history, on a close analysis of material traces, of soil and vegetation, but everywhere the attempt is to tune in to the experiences of those who struggle for liberation and are most exposed to Israel's violence.

The medium of soil brings together these different scales and durations. The reservoir of cultural and biological life it holds, millennia in formation, can be destroyed in an instant.[42] Throughout the genocide, Israel's acts of ungrounding extended from surface to depth, from the broken cities and camps to the subsoil underneath. The near subsoil contains life-sustaining infrastructure like water, gas and sewage systems. Ungrounding cuts through infrastructural pipework, scrapes through grave sites

and archaeological remnants dating back thousands of years. The subsoil is also a vibrant biosphere – containing an ecosystem of bacteria, earthworms, fungi and decayed organic matter which generates nutrients crucial to sustaining plant life on the surface. When they explode in the depths, craters destroy this biomass and reshuffle soil strata. Bombs discharge into the ground explosive residues and heavy metals such as lead, copper, zinc and barium. Bombed out and pulverised buildings release chemicals, fire contaminants and asbestos (which still existed in older buildings in Gaza).The rain carries these substances, with sewage from bombed-out wastewater facilities and oil spilling from hundreds of military vehicles, deeper into the subsoil.[43] Thousands of unexploded ordnance add further hazards beneath the surface.[44] Many of these substances will take centuries to decay, and affect the physical, chemical and biological composition of the ground. Ruptured, upturned and toxified, the soil produced by the process of ungrounding has turned a lived-in landscape into what a former Israeli officer describes as a place 'where no human being can exist'.[45]

Part I

Soil



Leaflets with orders to evacuate Gaza City and its surrounding areas filled the sky on 13 October 2023. They are amongst the most lethal things dropped by Israel from the sky, triggering the displacement of most of Gaza's population. Mohammed Talatene, 2023.

Expulsion

On Friday morning, 13 October 2023, there was a brief lull in aerial bombing.[1] During this short and unexpected silence, only leaflets were dropped on Gaza. Videos from the ground recorded clear skies through which thousands of papers fluttered and swirled in close formation like grains of sand in turbulence. Then they spread to fill the sky more evenly as they slowly fell to the ground. Alia Kassab from Gaza City described such a vision in an interview with Middle East Eye. 'My little brothers were happy to see coloured papers falling from the sky. They thought it was a new, interesting activity.' The leaflets fell so slowly that one could pluck them from the air. 'The rest of us were terrified,'[2] knowing these were warnings, acts of psychological warfare or propaganda. Some chose not to pick up and read these leaflets, letting them remain scattered on the devastated ground. Others collected them to light a fire, or to be used as wrapping or toilet paper. These leaflets, containing nothing but words and maps, were some of the most lethal things to have fallen onto Gaza. The message read: 'Urgent statement! To the residents of Gaza City. Terrorist organisations have started a war against the state of Israel, Gaza City is now a battlefield. For your safety and the safety of your families you must evacuate your homes immediately and head to the areas south of Wadi Gaza.'[3] The army elsewhere announced that people had twenty-four hours to do so. Panic ensued. A day was not long enough to evacuate a city of more than a million people. There were not enough vehicles. There was not enough fuel in those that were available. Many of the roads were blocked with the rubble of bombed-out buildings. People refused to leave family members trapped in the rubble behind, shouting into the ruins in the desperate hope that loved ones had survived and could hear. When hope died, some spray-painted the names of their missing children on the broken concrete slabs that were their homes – 'Omar and Usama under

the rubble' – and attempted to make their way south of the wadi.[4] Israeli officials promised Nakba 2.0 and the leaflets produced scenes reminiscent of the mass expulsions that occurred throughout Palestine in 1948.[5] Images of displacement erupted like traumatic flashbacks of a history never fully repressed. Hundreds of thousands made their way on foot, holding on to their children and some essentials, pushing wheelchairs with the elderly and infirm, the wounded and the martyred. In the night the sky was lit with the glow of white phosphorus bursts. Displaced Palestinians crossed the bridges over Wadi Gaza, along the routes that the leaflets said were 'safe' for evacuation. These routes were not safe. Israeli drones turned the long journey into a death march.[6] After a day of walking, many arrived in ramshackle cities of improvised tents and huts along Gaza's southern border with Egypt.

The leaflets dropped that morning had only one geographic element drawn on a map of the Gaza Strip: a curly line labelled Wadi Gaza and two graphic ones: arrows pointing south. *Wadi* is an Arabic word for a valley or a ravine, and Wadi Gaza is a seasonal stream that meanders through the southern agricultural fringes of Gaza City. Horror, chaos and confusion amplified panic and doubt. 'Where do they want us to go?' That the residents of Gaza were ordered to cross a natural feature, not a major road, a town, a village or a neighbourhood, not anything that was man-made, was ominous. Israel's ungrounding would leave little except the natural environment to orient oneself by.

Evacuation order leaflets dropped over Gaza City. Jack Guez, 2023.

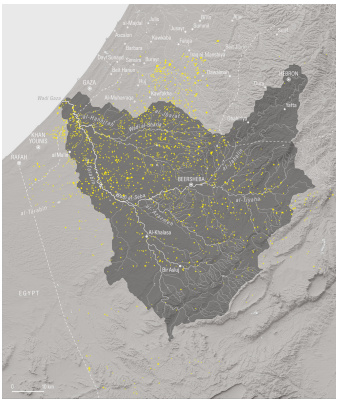
The only place named on the map in the leaflet from 13 October 2023 is Wadi Gaza. Two arrows send Palestinians south of it. Mohammed Talatene, 2023.

At the end of October, Israeli forces rolled in across the fences they'd erected to put Gaza under a decades-long siege and moved along the northern bank of the wadi. This otherwise dry stream

bed provided the organisational logic of the genocide, in which environmental and climatic elements played a role. The stream cut the Strip in two, a slightly smaller 'north', and 'south'. Israel warned that any Palestinian found within the north would be 'identified as a member of a terrorist group' and killed. The south became an area into which Palestinians were concentrated 'for their safety'. It had no adequate infrastructure, shelters, medical care, or food for all those that crossed the wadi, and it was also not immune from bombings.[7] In the following months army bulldozers piled high earth berms along the stream line, fortifying the wadi line. Anyone attempting to cross the wadi northwards and return to Gaza City, an Israeli soldier said, 'gets a bullet in the head'.[8] Wadi Gaza became the genocide's guillotine.

Wadi Gaza

Most non-Palestinians following the news would have first heard of Wadi Gaza when Palestinians were expelled beyond it. But the region's farmers, past and present, were deeply familiar with it. The stream and its many tributaries are the key environmental features of the Gaza–Beersheba area – the area now often referred to as the northern Naqab, the Arabic place name for the Hebrew Negev (the book will refer variously to Naqab and Negev depending on the context). The large water basin of Wadi Gaza had, over millennia, organised farming practices, systems of land ownership and trade routes around this part of Palestine. The wadi had likewise determined the logic of the expulsion of Palestinians during the Nakba, and that of the planning of the Israeli settler project after the expulsions.



The Wadi Gaza basin (dark grey) is the largest along Palestine's Mediterranean coast. North of the wadi begin the villages of the Palestinian farmers (white dots). Within the basin, organised along the wadi's tributaries, were many of the homesteads and small farming localities of the Palestinian Bedouins. In the last months of 1948, the Israeli army expelled these Palestinians downstream to Gaza or upstream to the Hebron area.

In winter rain clouds rolling in from the Mediterranean break against the Hebron Mountains in furious bursts. The basin of Wadi Gaza is huge, almost 4,000 square kilometres and a hundred kilometres long from source to end. The dry earth cannot absorb millions of cubic metres of water falling all at once, and winter floods rush down the slopes, gathering into hundreds of small wadis, dry for most of the year. This is a dangerous time. The inhabitants of the region have learnt how to gauge their distance from the rushing streams, but travellers and adventurers have throughout the generations been taken by surprise by sudden floods, their bodies found downstream. The floods spread lime dust, alluvial soil, clay, sludge, silt and gravel rich with precious organic matter along the banks of the tributaries. The basin is one of Palestine's most fertile areas. After the floods the stream banks are painted purple and red with thousands of flowers. Grasses and reeds hide turtles and frogs as they try to survive the migratory seasons of storks.[9] The spring is short, a mere few weeks, the stream beds dry fast, then the long harsh summers begin. The

wadi is the Naqab's last gush of fertility, south of which plant life slowly fades into the deserts of the Sinai.

Until 1948 each tributary of Wadi Gaza was settled by a different Palestinian farming community. They installed small dams, canals and terraces to channel the winter run-off into fields and walled gardens where they cultivated orchards of almonds, apricots, figs and grapes. Most of the slopes were sown with wheat and barley. All along the tributaries – from their source on the western edge of the Hebron Mountains, through its middle course at Beersheba, all the way to the wadi's mouth south of Gaza City – archaeological sites blend into modern habitation. Some structures, dams and wells have been in continuous use since the Romans through the Byzantine and the different Muslim periods with each culture maintaining and adding to the structures of its predecessors. Between them are thousands of wells, stone houses, clusters of tents, livestock pens and cemeteries belonging to different Bedouin tribal confederacies – al-Hanajrah in the northern tributaries and along the Wadi Gaza estuary, al-Tiyaha east of Gaza, al-'Azazme and al-Tarabin in the southern tributaries of Wadi Gaza. Bedouin communities in these parts and others were not 'nomadic' as Europeans and later Zionists made them out to be. Each clan had a *dira* or tribal territory at the centre of which were built structures and wells. The entire basin of Wadi Gaza is referred to by the societies that inhabited it as the Sharia – the open lands. In the summer herders took their livestock to the Sharia when all plants in the southern, drier part had already been consumed. Given the scarcity of grazing lands and their significance for their ways of life, the Sharia was not as open as its name makes it appear to be, but the object of constant conflict between clans and tribes, and between them and the southernmost farming villages.[10] However, there was never a clear line dividing the 'Bedouins' from the farmers or 'fellahin' whose denser villages begin north of the wadi. As Palestinian academic Mansour Nasasra, who still lives in the region, writes, identities rather bled into each other through the daily dynamic of exchange, trade, education and marriage. Some

villages had mixed communities, though tribal societies tended to settle in the margins of the built-up areas.[11]

As water flows westwards towards the coastline, smaller tributaries drain into two larger streams – Wadi al-Sharia in the north and Wadi al-Seba in the south – which in turn gather into the main stream of Wadi Gaza some ten kilometres from the coast. After their connection point the volume and speed of water increases and the ravine edges become deeper, though clay is still spread wide beyond the banks all the way to the estuary. Rich in lime, this clay makes a strong and malleable material well suited for pottery. For centuries, uniquely sweet grapes grew on the clay deposits right at the water's edge. In the Byzantine period, wine was exported in amphoras baked from the same clay in which the grapes grew.[12] Where Wadi Gaza meets the Mediterranean stands Gaza's oldest archaeological site: Tel al-'Ajjul, possibly the site of ancient Gaza, dating back to two millennia before Christ. According to the late Gaza-based historian Salim al-Mubayyad, the ancient settlement was the threshold of the desert where caravans coming from the Sinai first found 'mud and fertility after sand and drought, and abundant water instead of spring water scattered in the middle of a great ocean of sand'.[13]

Orientalists

Zionism's predecessors, the nineteenth-century European travellers to the Ottoman 'Orient', similarly considered Wadi Gaza to be the edge of the desert, and the gateway to Palestine. Cartographers such as the German Heinrich Kiepert and the Dutch Willem van de Velde framed their maps of 'Palestine' (1841) and the 'Holy Land' (1858) respectively with Wadi Gaza at or near the bottom of the page. The most detailed nineteenth-century map of the region was the 1881 'Map of Western Palestine' by the British Palestine Exploration Fund. The dense details of topography, settlements, routes and water sources – so useful for the British Egyptian Expeditionary Force (EEF) in its First World War campaign for the occupation of Palestine almost four decades

later – abruptly ended south of the wadi. The only annotation on the empty parched paper south of Wadi Gaza is ‘Arab el-Terabin’, the territory of al-Tarabin,[14] the largest of the Bedouin tribes in the region whose territory extended from the southern tributaries of the Wadi Gaza basin all along the coastal trade route of north Sinai which they dominated for centuries. One of the reasons for the abrupt end to the map was that the Holy Land was conceived in counter-distinction to the desert, with Wadi Gaza, the desert gateway, being its threshold.

The southern section of the Palestine Exploration Fund’s (PEF) 1881 Map of Western Palestine. The details of the map end in Wadi Gaza. The only annotation in the ‘white part’ of the map south of the wadi is ‘Arab el-Terabin’ (the territory of the al-Tarabin). Arrows from Israeli displacement orders have been overlaid on the map. In a remarkable return of the cartographic subconsciousness of Zionism, these arrows sent Palestinians outside the borders of the Holy Land.

The common route of European travellers to Palestine was from the port of Alexandria eastwards along the coastal route. Several of those travellers recorded a similar impression upon approaching Wadi Gaza – awe at the sudden transformation of the environment. ‘Like a joyousness of life conjoined to the shadow of death, the fields of Gaza, with their cheerful fertility, were linked to the edge of the desert,’ writes German biblical scholar Constantin von Tischendorf as he approached Wadi Gaza. ‘It

seemed a magical delusion – like a joyful picture starting suddenly from the colourless canvas.'[15] In 1865 the biblical scholar Henry Baker Tristram saw among the hills surrounding the Wadi Gaza tributaries the 'cultivation of large portions of unfenced land for corn…wheat and barley'.[16] In 1883, Irish geologist Edward Hull described 'an undulating plain, over the sides and hollows of which was spread a deep covering of loam of a very fertile nature'. The area reminded some travellers of Tuscany. In 1799, crossing with his army from Egypt into Palestine along the same route, Napoleon marvelled at the same transformation: 'The lemon trees, the olive groves, the ruggedness of the terrain look exactly like the countryside of the Languedoc.'[17]

The descriptions of these European travellers were filtered by a theological imagination that saw the wadi's microclimate, the sharp edge of the desert and the entry into Palestine as the fulfilment of an ecological biblical promise. This form of environmental Orientalism blinded most travellers to the way the inhabitants of the areas south of the wadi cultivate a variety of different crops.[18] On the ground, the climatic transformation occurs along a longer gradient. On the southern bank of the wadi are the palm date orchards of Deir al-Balah. Further south, within the coastal dunes of al-Mawasi, smaller pans dug within the sand provided enough water for small garden patches. After this, vegetation thins out and the patches of green shade into the yellow of the baked sand and the ochre of the desert's mineral geology.

The meteorological and ecological transition is caused by the change to the orientation of the coastline. The Gaza City area is at the south-eastern corner of the Mediterranean. Around the city as an imaginary hinge, the shoreline starts its slow ninety-degree turn from the western coasts of Palestine, Lebanon and Syria, to the northern coast of Africa. The prevailing wind in this region is westerly. North of Gaza City it arrives onshore heavy with moisture gathered from the Mediterranean and the area receives a relatively generous average annual rainfall of 400–500

millimetres. Further south, the westerly winds come barren from over the Sinai Desert, the quantity of rain rapidly reduced with every kilometre one moves south of the wadi. Around Rafah, just over twenty kilometres south of Wadi Gaza, annual rainfall is less than 200 millimetres, and most plants disappear.

In 1906 the Ottoman and British empires established the border between them along a line connecting Rafah to Aqaba on the Red Sea.[19] This line is still the border between Palestine and Egypt. However, Wadi Gaza returned as Palestine's defensive frontier a decade later. In early 1917, towards the end of the First World War, the 4th Ottoman Army built a formidable line of fortification all along the tributaries of Wadi Gaza and managed to hold off the advancing British EEF which marched on Palestine from Egypt. The Ottoman calculation was that attrition along this line would keep the European soldiers in the more arid side of the wadi with little water and pasture for their tens of thousands of horses and mules.[20] The land along the south bank of the wadi's estuary was cultivated by the Abu Meddein family of the al-Hanajrah tribe. The family is said to have aligned with the British, and the EEF constructed their front-line bases near and on their lands.[21] For six months, several hundred thousand EEF soldiers managed to withstand the dry climate by pumping water from wells along the southern edges of Wadi Gaza. From these bases it had undertaken a massive artillery campaign that demolished large parts of what was then the town of Gaza.[22]

After two failed attempts in March and April of 1917, the last day of October saw British forces breaking through the Ottoman defences. A unit of the Australian cavalry rode undetected within the still-dry stream of Wadi Gaza's southern tributary, Wadi al-Saba, into Beersheba. They broke through the Ottoman army flank and overran the small Turkish garrison there. The divergence disoriented the Ottoman defenders and the town of Gaza was easily overrun.[23] It took two days for the news to arrive in London.[24] On 2 November 1917 the letter from the British prime minister containing the Balfour Declaration, promising to support the establishment of a Jewish national home

in Palestine, was sent. The declaration had been written weeks earlier and only awaited this military breakthrough before being issued. The roads north to Palestine's cities were open. Jerusalem fell before Christmas, the Ottoman era of Palestine ended within a year, the British Mandate was established and started implementing the principles of the Balfour Declaration in supporting Jewish immigration and Zionist colonisation.[25]

After the war, European scientists undertook measurements to determine the exact location of the elusive threshold of the desert. Factoring temperature and evaporation, the desert was defined to be areas with less than 200 millimetres of annual rainfall, the minimum necessary, their experiments showed, to cultivate cereals on a flat surface without artificial irrigation.[26] From that time on, rain in the region was measured and mapped. Like a shoreline, the rain line ebbs and flows. In plentiful years, grasses flow southwards past Rafah; in drought years the parched yellows of the desert crawl northwards past Wadi Gaza. These fluctuations were averaged out, and a line was drawn on the map. In each meteorological map the path of this line is slightly different, but in all of them it is somewhere between Wadi Gaza in the north and Rafah in the south. From there the so-called 'aridity line' moves east of Hebron and then over the slopes of the Jordan Valley, past the border to Jordan, later to disappear behind Jabal Amman, and continues along the edge of the great Syrian Desert. On most meteorological maps it is across the aridity line that the gradient of blue stripes flips over to yellows and browns.[27]

The Wadi Gaza line beyond which Palestinians were expelled is no longer the border of Palestine, and artificial irrigation with purified or desalinated water has expanded cultivation southwards well beyond it, further blurring the threshold of the desert. Superimposing the 13 October expulsion order over historical and meteorological maps of Palestine, however, demonstrates a curious coincidence. Israel displaced Palestinians into the 'white part' of Palestine's nineteenth-century maps; and from the blue to the yellow parts of its meteorological ones. The long-forgotten wadi seems to have re-emerged from the Zionist

cartographic subconscious – shaped equally by nineteenth-century Christian theologians and travellers and by meteorological science – and has since been absorbed into the gorged ego of the Israeli government, with its expansionary ethos, becoming the main territorial element organising the logic of the Gaza genocide – the largest attempt at population transfer in the history of Palestine.

Soil

Geology closely interacted with the area's history. Life and death on the south-western coast of Palestine is organised in relation to soil. The area is formed by an encounter between sand and sediment, moving in opposite directions. Sand is a mixture of grains of different substances and origins.[28] It starts its journey from afar. Massive granite rocks in the high plateaus of central East Africa, around today's Ethiopia and Eritrea, slowly erode into small particles of rock (sand is defined as grains around two millimetres in size). Millions of cubic metres of sand aggregate drain annually into the Nile and get carried 7,000 kilometres downstream before pouring into the Mediterranean. There, the sand is transported eastwards by sea currents. At the bottom of the sea the Nile sand mixes with small particles of marine skeletons, shells and corals. Coastal waves throw large quantities of this now marine sand all along the Palestinian shoreline. There it rises into dunes that drift, wave-like, further inland. A few kilometres from the coastline the east-drifting dunes meet viscous soil draining in the opposite direction from the Hebron Mountains towards the coast. Small quantities of lime dust from the mountains' rocks are enough to crystallise the sand into a brittle and light sandstone, known locally as *kurkar*.[29] The sand dunes get petrified into three ridges, ancient dunes that rise parallel to the coastline. The first sandstone ridge right at the water's edge is a fifty-metre-high cliff overhanging the sea like a frozen wave. It is where the al-Shati refugee camp would be built shortly after 1948.[30] Some three kilometres inland, the second sandstone ridge reaches eighty metres in height, and is where the al-Bureij

and al-Maghazi refugee camps would be built along the southern bank of Wadi Gaza. Approximately ten kilometres from the coastline and more than a hundred metres above sea level, is the third and highest of the sandstone waves. It is there that the village of Ma‘in Abu Sitta was located, and it is along its entire length that the first line of kibbutz settlements that enclosed Gaza would be built after the expulsions of 1948.[31]

Each of the three types of soil – clay, sand and sandstone – had historically given rise to different manufactured products. Lime-rich clay is suitable for pottery, and the quartz-rich marine sand enabled early experiments in glass production that the area’s Phoenician inhabitants were famous for since at least a century before Christ. The natural occurrence of sandstone inspired the area’s ancient inhabitants to produce lime-mortar cement, an early form of concrete.[32]

As the sand dunes drift inland they threaten to cover the agricultural fields near Khan Younis. Trees planted along the dunes’ edge (irregular black spots) attempt to anchor them in place. The Khan Younis refugee camp was built in 1949 at the edge of the dunes in another attempt to dam their flow although the first line of fields in this image is already covered by sand. US Geological Survey, 1963.

The meeting point between sand and sediment is roughly three kilometres from the shoreline. Along it runs the main branch of the region’s oldest trade routes, the coastal road known by the

Romans as the Via Maris or 'Way of the Sea', which linked the kingdoms of the Nile, through northern Sinai and Palestine with those of the Euphrates. If you drive north along this route, on your left will be sand and on your right fertile agricultural soil. The main facilitators of trade along this route were, in recent centuries, clans affiliated to the al-Tarabin tribal confederacy. The part of this route going through the Gaza Strip coincides roughly with Salah al-Din Road, Gaza's main traffic artery and commercial spine (it was along this road that on 13 October 2023 Israel ordered the southwards evacuation of Gaza City, and on which it attacked those marching).[33]

In 1858, seeking to increase tax revenue across the Empire, a land reform was instituted to incentivise agricultural production by granting a form of private ownership to those who cultivated land. Uncultivated lands or *mawat*, dead land, were the property of the sovereign, the sultan. Sand dunes were the archetype of this Ottoman conception of wastelands, non-property. (It was only in the British Mandatory era that the sand dunes along Palestine's coast became prime real estate.) In the imagination of the orientalist travellers to the region, the sand dunes were not a natural phenomenon, but rather the consequence of the Muslim occupation of the Levant in the seventh century. Neglect, they believed, allowed the dunes to cover the agricultural fields, canals and aqueducts established by the Romans and Byzantines. Orientalist traveller Edward Henry Palmer wrote in 1871 of the Bedouin: 'To call him a "son of the desert" is a misnomer; half the desert owes its existence to him, and many a fertile plain from which he has driven its useful and industrious inhabitants becomes in his hands…a parched and barren wilderness.'[34] This portrayal of the Bedouins as agents of desertification, is yet another manifestation of the travellers' orientalist racism: archaeological evidence suggests that soon after the Arab conquest in AD 640, agriculture was expanding and improved techniques of irrigation were being introduced. The expansion of the dunes was rather part of a natural cycle.[35]

The Ottoman land reform of 1858 also aimed for private

property to replace the communal form of land tenure known as *masha'* where the ownership of cultivated and grazing areas was shared by an extended family or clan. The *masha'* created, in the words of Palestinian food activist Mohammed Abujayyab, 'a very strong social bond that made villages act collectively, defend their land collectively and see each other in that common social loom that was woven'.[36] The land reform helped the Ottomans extract more taxes from the farmers but ended up turning agricultural land into commercial property and thus facilitated its purchase by Zionists.

Around the last quarter of the nineteenth century, barley was exported through the port of Gaza to Britain where beer consumption rose with the popularisation of the emergent institution of public houses for working-class men during the Industrial Revolution.[37] For several decades the barley export brought prosperity. In the 1920s, Prohibition in the US led to an excess of barley in California which grew in similar conditions at the threshold of the Mojave Desert. Cheap Californian barley flooded the European beer market and led to the destruction of Gaza's barley economy, which in turn led to the collapse of the price of land in the Beersheba–Gaza area. Following the destruction of the export economy, both the grain and straw of barley started to be sold locally as animal feed mainly during the hot summer months (locally grown barley is still sold as animal feed today) and powered the animal-drawn trade along the Via Maris. The economic downturn, however, affected the resilience of the farming communities and of Gaza merchants. Some communal lands were sold on the market.[38] The area had never had the opportunity to recover, and the downturn contributed to the speed at which the Beersheba district collapsed during the Nakba.[39]

Farming around the southern coast of Palestine depended, writes historian Dotan Halevy, on the labour of fixing the sand dunes from drifting further inland and encroaching over the fertile agricultural soil east of the road. From the early twentieth century citrus orchards were planted along the dunes' edge to

anchor them in place. During the time of the British Mandate, the task of fixing the sand was delegated to the foundations of buildings. Beyond being considered as wastelands in themselves, Halevy adds, the dunes were seen as an agent of devastation, 'laying waste' to the agricultural areas to the east.[40] The neighbourhood of Rimal – the name refers to the Arabic word for sand – was the first to be built of concrete as a modern city neighbourhood on the dunes outside of, and in contrast to, Gaza's Old Town. The architectural style was not fully modern. Palestinian sociologist Abaher El-Sakka wrote that although built in concrete, some buildings still retained some late Ottoman elements like pointed arches, floors and patterns of ornaments.[41] Rimal was however somewhat similar to other neighbourhoods that evolved outside the old cities in the Mandatory period: the Palestinian neighbourhood of Manshiya and the town of Tel Aviv were built outside Jaffa at roughly the same time. Like them, Rimal anchored the dunes in place.[42] After the Nakba of 1948 some of the refugee camps of the Gaza Strip – Jabalia, al-Shati, Nusseirat, Khan Younis and Rafah – would likewise find available space on the open dunes.[43]

Nakba

Between December 1944 and May 1945, the last months of the Second World War, British Royal Air Force (RAF) squadrons were sent to Palestine to undertake a systematic aerial survey of the country. Five thousand aerial photographs were taken from 15,000 feet. Each captured an area of four square kilometres, providing a benchmark record of the last years of British Mandate-era Palestine before the Nakba. The photographic survey progressed from south to north. The reconnaissance aircraft flew over the Beersheba district in January, the peak of the rainy season. The black-and-white photographs captured Wadi Gaza's basin in a state of full cultivation, covered with a patchwork of fields. British aerial analysts poring over the images marked 8,722 tents and 3,389 stone dwellings. After the survey was completed,

the Jewish labour movement paramilitary organisation of the Haganah managed to convince a sympathetic archivist to smuggle some of the negatives out of RAF archives. They printed and returned the originals before their absence was noticed. A number of these reproductions were included in the 'Arab Village Files' – intelligence documents on Arab localities that were used in 1948 by Israeli paramilitaries and later by the army to occupy the villages and expel their inhabitants.[44]

The Wadi Gaza basin was relatively late to Jewish colonisation. In 1943, the Jewish Agency set up three research outposts and by the end of 1946 eleven small agrarian outposts of the Beersheba district. The outposts were not much more than a few fabricated homes or tents inhabited by several dozen armed settlers, and not all of them were permanently inhabited. They aimed mainly to demonstrate the Zionist claim to the area to the international bodies that proposed different lines of partition, and to demand the inclusion of the Beersheba district within the parts of Palestine allocated to the Israeli state.[45] The presence of these outposts resulted in the allocation of most of the area to Israel.

The resolution on the partition of Palestine was passed by the UN General Assembly at the end of November 1947. Violence broke out almost immediately. The massacre and expulsion of Palestinians and the destruction of villages began in December 1947, but it was mainly in 1948 that around 750,000 Palestinians were violently expelled from their villages, towns and cities, at first by Zionist paramilitaries, and after the establishment of Israel, by its army.[46] By the time the state of Israel was declared on 14 May 1948, Tiberias, Haifa, West Jerusalem, Acre, Safed and Jaffa were already occupied and violently depopulated, and more than half of the Palestinians who would be refugees after the war had already been forcibly displaced. Some of the Palestinians expelled from Jaffa and Haifa arrived in Gaza City, but the vast majority came from areas south of Jaffa.

The Haganah acted according to the notorious Plan Dalet finalised on 10 March 1948, which included instructions to 'capture, clear, destroy' Palestinian villages and expel their

population. The bombing of homes and the burning of fields was meant to prevent Palestinians from returning to the areas from which they had been expelled. In early May, Haganah forces progressed south along the coastal road that linked Jaffa and Gaza. One Palestinian village after another fell. Tens of thousands of expelled Palestinians were forced to walk along the coastline to Gaza. On 13 May the Negev Brigade of the Haganah occupied Burayr, one of the largest villages on this roadway, which had a relatively large armed force, after a series of failed attempts. Dozens of Palestinians were executed. 'We smashed through dank-smelling holes that are their homes…broke their walls and incinerated their houses and broke and destroyed and smashed and killed that cold way,' recalled one of the soldiers who participated in the massacre.[47] The remaining inhabitants fled to Gaza. Fatma Hussein Oraib was eleven years old when she packed her belongings and left Burayr. 'My parents were very scared of the war and said we had to leave,' she recalled of the moments that changed her life for ever. 'I held my nephew's hand and we walked a long distance to find a safe place.' The family arrived in al-Majdal, the next large coastal town north of Gaza City, which was not yet occupied, and stayed there for a few days before walking further to Deir al-Balah. After the war she settled in the refugee camp of Rafah in the southern part of the Gaza Strip and later moved to Jabalia refugee camp. On 13 October 2023 when all residents of the northern Gaza Strip were ordered to leave their homes, Fatma, by then eighty-six years old and confined to a wheelchair, was moved by her family to Rafah and from there onwards. 'There are similarities between the Nakba of 1948 and what is happening in the war today,' she told the Palestinian news agency Wafa after moving to Rafah. 'The thirst, the hunger and the search for a safe place were the most prominent things then,' she said. 'But the war now is harder, entire families are being wiped out.'[48]

On the night of 13–14 May 1948, shortly before the announcement of the establishment of the state of Israel and the official end of the British Mandate, the village of Ma'in Abu Sitta,

located on the third and highest sandstone hill overlooking Khan Younis and the southern Gaza coastline, was occupied by Haganah forces, who expelled the village's inhabitants. The Abu Sitta family are Bedouin Palestinians belonging to the al-Tarabin tribe. The village produced several well-known sons, prominent amongst whom is Salman Abu Sitta, a structural engineer by training who has become one of the foremost chroniclers of the ongoing Nakba and a tireless advocate for the right of return of Palestinians to their lands. Born in 1937, he was ten years old when the Zionist paramilitaries expelled him and his family from his village. From his home in Kuwait, and the offices of the Palestine Land Society in Beirut and London, Salman dedicated his life to compiling *The Atlas of Palestine*, and to documenting his life story, much of which is published in an engrossing memoir titled *Mapping My Return*.[49]

Salman Abu Sitta pointing to the centre of al-Ma'in in a British Survey map during the digital reconstruction process with Forensic Architecture. The location of Nirim's Pentagon, and its designated agricultural areas, were hand drawn by Israeli planners on top of the map. Forensic Architecture and Salman Abu Sitta, 2025.

Salman

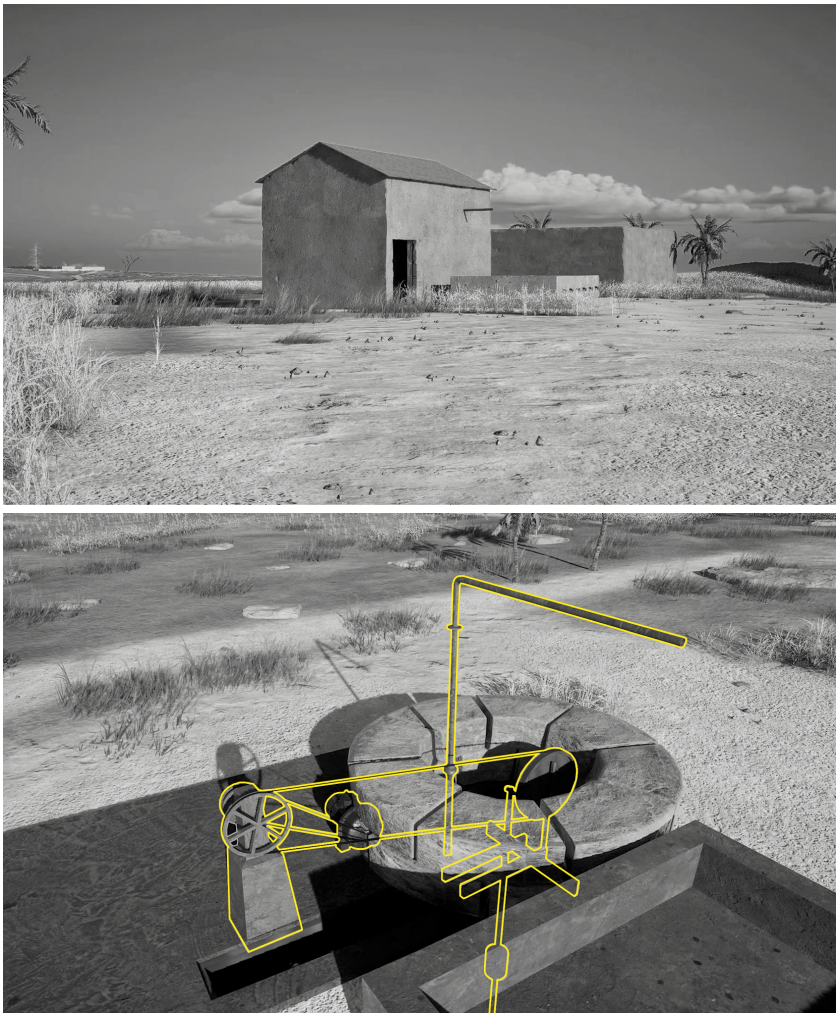
In February 2025 Salman Abu Sitta arrived at the Forensic Architecture offices at Goldsmiths, University of London to work with us on a full spatial reconstruction of the village of al-Ma‘in and the events of 13–14 May 1948. With his white hair, suit with matching tie and handkerchief, leaning on a stick and helped by his daughter Rania, who is a director at the Palestine Land Society, he looked like an old-school gentleman, especially in contrast to the young international architects on the Forensic Architecture team. Wandering through our offices he expressed some worry that the work on al-Ma‘in would disrupt our investigations on the unfolding genocide in Gaza. We agreed that a time of crisis demands balancing urgency with historical consciousness, as well as, of course, about the centrality of al-Ma‘in to this history. The village, as we will see, is a cross-temporal hinge that brings together the Nakba and the genocide.

Salman's work combined the moral force of a refugee with an engineer's attention to detail. This combination made me particularly drawn to his work. We had worked together previously on the reconstruction of the occupation and depopulation of the Palestinian villages of Tantoura, on the northern coast of Palestine, and Dawaimah on the western slopes of the Hebron Mountains. In both villages Zionist forces conducted massacres in 1948, but the locations of the mass graves were lost to time.[50] Searching for them was an important component in understanding the way Israeli forces expelled Palestinians from areas they occupied. Working together with survivors, retracing their steps within three-dimensional models, and comparing their memory maps to the existing landscape, we managed to locate several mass graves.

Salman had collected an extensive amount of material regarding the history of al-Ma‘in. His is a rare archive of Palestinian Bedouin life in the Beersheba district before the Nakba. But archives are never complete, and he asked me to help find more material – texts, planning documents drawn up by Israeli architects and aerial images taken by the Israeli air force – that would help him understand what had happened in his lands

after his displacement. ‘I want to know more about the people who took my land,’ he told us. ‘How was my landscape destroyed, and what was the logic behind the planning of the area? How did they shape their landscape? How did they select the location of the new kibbutz settlements? What were the first installations they made?’ Much of the material in what follows comes from an attempt to answer this question.

The digital reconstruction of al-Ma‘in with Salman Abu Sitta in 2024.



The digital reconstruction of the well-house, the well and the motorised pump. Looking at the model, Salman said, ‘The only thing left is for the people of the land to be standing here.’ Forensic Architecture and Salman Abu Sitta, 2025.

The Star

In preparation for the meeting, we built a topographic model of the area of al-Ma‘in based on topographical data, whatever written testimonies we could find and on the RAF aerial images. The reconnaissance flight overflew al-Ma‘in on 28 January 1945. The village is located on a sandstone ridge near the source of

Wadi al-Ma‘in – also known as Wadi Farha – a deep ravine that drains into Wadi al-Seba, Wadi Gaza’s southernmost tributary. In our office, Samaneh Moafi led the project. She and the team were able to locate and model the roads, the fields and some of the built structures. As Salman sat down with us, we demonstrated how, based on his recollection, different elements within the model could be adjusted and detailed and how trees and other types of vegetation – wheat, grasses, barley – could be added.

From the centre of the village a nexus of seven routes fanned out in all directions like a wind rose: west to Khan Younis, north-west to Deir al-Balah and Gaza, east to Beersheba, with other routes leading to surrounding villages. The structure of the village was not as dense as the farming villages further north in Palestine, whose buildings are closely packed together around a mosque and a central market square. Bedouin villages in the Beersheba district are sparser. Different branches of the Abu Sitta family were each located along another of the radial routes. Each stone house was surrounded by clusters of tents. The circular layout is also a political diagram. Decisions are taken after discussion between the heads of these families.

Aerial photographs can be unintelligible without a lived experience of an area. Zoom into the scale of the photographic grain and traces become intelligible; Palestinian Bedouin societies in these parts leave faint marks on the ground. In the resolution of the film, a darker spot can be a pile of hay, an earth mound or the opening of a waterhole. A line can be a pedestrian route, a water canal or a scratch on the film’s negative. Interpreting these signs requires familiarity with the ground. With lived knowledge of an area the reading of aerial images is undertaken not from the top down as intelligence analysts do but from the ground up.

Near the crossroads at the heart of the village is the main well (there are several others throughout al-Ma‘in), several small built structures, a walled orchard and a garden. Water was extracted with buckets originally pulled over a pulley by camel rotation. The Abu Sitta family was one of the first to introduce agricultural mechanisation to the area. In the late 1920s or early 1930s –

Salman couldn't remember – his father, Sheikh Hussein Abu Sitta, bought a diesel-operated water pump from Jaffa or Haifa and installed it over the well. The structure, meant to protect it, had a concrete foundation. It was one of the first uses of concrete in this part of Palestine. A partner in paying for the installation of the pump was Salman's uncle Mohamed Saqr, known as Abu Ibreisha (either after the name of mechanics who installed the pump, or after the dark blemish – the *ibreisha* – on his hand, Salman said). In the early 1940s the family installed grain silos within the structure, which we modelled in great detail from Salman's memory. There were two small shops in the vicinity of the crossroads, each owned by another trader, competitors from Khan Younis. When the 'blind man's shop' – as Salman referred to it – did well selling sugar, tea and coffee to those passing through the crossroads, another shop popped up. The new shop owner was killed by Haganah paramilitaries when the village was occupied on 14 May 1948.

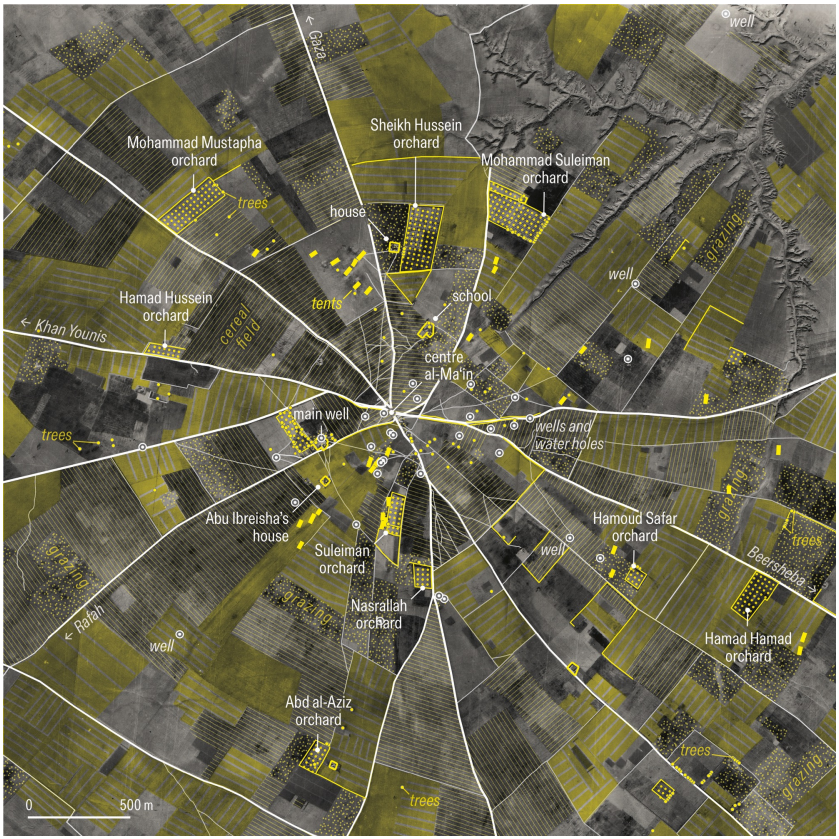
In the 1920s, east of the crossroads, near the road leading to Beersheba, Salman's father constructed a school building at his own expense. The building, which later functioned as a regional school for boys, partially funded by the British authorities, had a yard bordered by cactus bushes and several trees. Sheikh Hussein, who was also a judge at the tribal court in Beersheba, believed in education. He sent his sons and nephew to study medicine, law and engineering in Jerusalem and Cairo. His own house was a walled complex with structures organised around a central courtyard, placed next to a fenced orchard.[51]

Agricultural Clockwork

Well-trodden paths appear lighter in aerial photography, planted areas darker. Informal routes are created through repeated walking. They disappear after a few years when people no longer walk them, and grasses overgrow them. Informal pedestrian routes record the continuity of movement between fixed locations and thus the relations and affinities between places, the logic of

agricultural production and commercial relations. These routes give shape to otherwise invisible social networks. On the image we saw that the main well was one of the nexus points of a bundle of routes. The routes led in different directions to the different stone houses that themselves functioned like secondary hubs from which other routes led to the different clusters of tents of different branches of the family. Other routes led to the school, the fields, the walled orchards and to the stream-bed. When the inhabitants of al-Ma‘in were expelled, the wells blown up, the buildings destroyed and the tents set on fire, some of the routes remained for a while, leading from nowhere to nowhere until they got fully covered by plants.[52]

Cultivation was arranged like a clock face around the central crossroads. Different branches of the family had their own walled *karm* (orchard). These were planted in the 1930s after Salman's cousin Mousa learnt the system of orchard cultivation in the Kadoorie Agricultural School in Tulkarm, named after the British-Jewish philanthropist Sir Ellis Kadoorie who founded two agricultural schools in Palestine, one for Arabs and one for Jews. The orchard had almonds and fig trees as well as vines. By the entrance to the orchard the family hid its weapons from the British police, who tried to disarm Palestinian villages. In the far end of the orchard was a hidden ditch made by the rains which led to Wadi al-Ma‘in, a means of escape.



Agricultural cultivation organised around al-Ma'in's central crossroads. The main well is near the centre. The living clusters of tents and hard structures (yellow rectangles) and orchards (yellow dots) of the different family branches were arranged radially around this crossroads. Farther from the centre, the fields were larger. The darker fields were grown with wheat or barley. Ploughed and newly seeded fields were divided between family members by wide strips (hatched yellow). Fields left fallow (yellow tint) after three to four years of continuous cultivation allowed the soil to regenerate. Agricultural interpretation by Mohammed Abujayyab, 2024. Forensic Architecture and Salman Abu Sitta, 2025.

For a plain-text version of this image, go to this page.

The Abu Sitta family cultivated 60,000 dunums (6,000 hectares), three-quarters of which were wheat and barley. They were wealthy landlords, settled on fertile lands, and possessed the

arms to defend them, though Salman played this down a bit. The family employed dozens of ploughmen and harvesters, and what Salman called 'African helpers'. Many Afro-Palestinians are descendants of enslaved Africans brought to the area by Ottoman slave traders. By the turn of the twentieth century chattel slavery in the European sense was no longer practised in Palestine; people were not bought or sold though many Afro-Palestinians were still performing domestic and manual labour and carried the surname of the families who employed them.[53] The name Abu Sitta, Salman wrote, was derived from the six (*sitta* means six in Arabic) African bodyguards who accompanied the founder of the family in the eighteenth century. Across Gaza today, Salman told me, one can still encounter black Abu Sittas.[54]

To better understand the evolving agricultural system in the area we spoke to Mohammed Abujayyab. His family is from the village of Yasur north of Gaza, and he grew up in the Gaza refugee camps of al-Maghazi on the southern bank of Wadi Gaza, and is currently based in California, where he works as a software engineer. Describing himself as a fellah, a farmer and a food-justice activist engaged in traditional agriculture, he is an enthusiast for traditional and Indigenous agriculture around Palestine. His close familiarity with the landscape, the local flora and cultivation techniques allowed him to help us read the 1945 aerial images of al-Ma'in from the ground up.

Mohammed identified a blurred section behind the main well as a grid of sunken garden pans for vegetables. Salman was enthusiastic to learn that. Faint lines divided the fields into sections roughly forty metres wide, each likely a family's share of the collective field. The lines he said could be marked with a type of perennial onion called an *ousalan* or with low stone walls. Mohammed estimated that half the fields were cultivated with barley, the rest with wheat and other crops.

Wheat needed more water. A plentiful year would result in more of it. The harvest of barley – which can handle saline soil, requires less water and plenty of sunshine – would offset the losses from wheat during drought years. The further south one

goes, the larger the proportion of barley. Ploughing, Mohammed showed us on the British aerial image, is undertaken perpendicular to the direction of the slope, to mitigate soil and water run-off. Cultivation depends on a sense of seasonal timing: seeding takes place in shallow furrows shortly before the first rains and harvesting shortly before the summer heat.

The year 1945 saw plentiful rain. On 28 January when the RAF images of al-Ma‘in were taken, the crops would have grown to about a metre high, enough to render the fields dark. Some of the irregular grey patches, Mohammed said, were fields left fallow or for grazing. Harvesting barley and wheat is undertaken at speed between late April and June. The expulsion of the family on 14 May 1948 occurred during the harvest season. ‘They took the land furnished,’ Mohammed bitterly translated a Palestinian saying. The lighter patches on the aerial images, he estimated, were fields left fallow. Every few years, farmers leave some fields unplanted so the land can regenerate. They then invite shepherds from further south to graze on it and leave their flocks’ precious manure to replenish the soil.

In the 1940s, after seeing benefits from the motorised well and the mill, said Salman, the family bought a tractor (Mohammed said it was likely a combine) to help with the harvest, but got rid of it when they realised it trimmed the stalks too high, wasting precious organic matter.[55] The British surveyors of Palestine must have had Ma‘in Abu Sitta in mind when they wrote: ‘The Bedouin are keen farmers and very much alive to the possibilities of improving their agricultural methods. Tractor ploughing has made considerable strides within recent years and an increasing area is being planted each year with fruit trees.’[56] It was certainly not the Zionists who made the desert bloom. In 1944 British Mandate officials placed a weather station in al-Ma‘in. It was located in the school yard. The station recorded between 200–300 millimetres of annual rainfall. The village is at the threshold of the desert, caught between the ebbs and flows of the annual rainfall fluctuations. Years of 300-millimetre rainfall allowed wheat to prosper while drought years of under 200

millimetres still allowed for some barley.

The Destruction of al-Ma'in

In many of the previous reconstructions of atrocities we undertake at Forensic Architecture with eyewitnesses' accounts of acts of extreme violence, we found that trauma has erased or distorted parts of the survivors' memory of an event. People tend to better remember what preceded and what followed a traumatic incident than the moment of intense violence itself. Immersive architectural models of crime scenes allow our teams to engage witnesses and reconstruct their experiences in a way different from a written or oral interview. The technique of 'situated testimony' – developed by Forensic Architecture – helps witnesses of extreme violence access some aspects of repressed memory. The acts of positioning digital objects within the model – a book, a chair, a plate – can help trigger otherwise obscured memories or locate disassociated ones. This can be painful, and needs to be undertaken with great care, with the witness having the necessary grounding, support and ability to stop at any given moment, but often leads to an entire sequence of events falling into place. The process takes place with witnesses accompanied by trusted people, family members, and on occasion with well-being specialists. We have previously used the technique in helping survivors of drone strikes in Pakistan, of the Grenfell Tower fire in London, of the Russian air strike on the Mariupol theatre in Ukraine, and of the Saydnaya military prison in Syria, enabling them to access lost details of their ordeal.[57]

Here things were different. Salman's nephew, the British-Palestinian surgeon Dr Ghassan Abu Sittah who we will meet in Part III of the book, had already told us before the interview that the trauma of the night had led to the opposite effect to that anticipated. Images had been arrested in Salman's memory in a vivid and complete way, down to the smallest of details. 'The past that I had just left behind became frozen in my mind and became my present forever,' Salman wrote in his memoirs, in a clear

demonstration of how traumatic memories often become ever-present. The ‘situated testimony’ felt like the final phase of reconstruction for someone who has dedicated his life to retelling his story and reconstituting these lost environments. The three-dimensional model allows for the dimension missing in mapping to emerge, and with it the sense of walking through a place long destroyed.

Of the Abu Sitta’s well-house only a metal pipe remained.

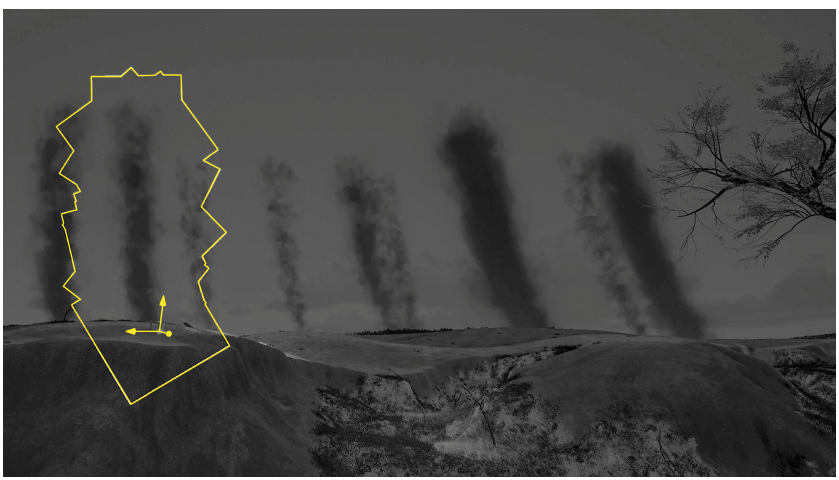
Abu Sitta’s mechanised well. Model and image match showing Salman’s brother, Ibraheem Hussein Abu Sitta upon his visit to al-Ma‘in in 1978. Forensic Architecture and Salman Abu Sitta, 2025.

The al-Ma‘in crossroads was strategic. Salman’s father and his older brothers were leaders of the armed resistance to Zionist colonisation. From 1946 settlers and Zionist militias in the areas called the village of al-Ma‘in the ‘star’ or the ‘outpost’, and referred to its inhabitants as a ‘gang’. The Haganah attacked on the night of 13–14 May 1948 on their way to the Jewish outpost of Kfar Darom south of Gaza City, which fell under siege. A soldier named Arye Aharoni recalls the excitement in the unit upon receiving the orders to attack al-Ma‘in. ‘Who in the battalion did not speak of it? This is the seat of Abdullah Abu Sitta, the organiser of the Negev gangs; the man whose reputation spread fear around him, that every Bedouin person has respect and awe to, the dominant and respected family in the Negev areas, who has contact with neighbouring countries. Occupying the house of Abu Sitta was tempting.’ Abdullah was Salman’s cousin but was brought up like a big stepbrother. Abdullah led the Arab Revolt between 1936–9 in Beersheba district and coordinated the defence of the area with volunteers from the Egyptian Muslim Brotherhood from 1947 until the Egyptian army entered Palestine on 15 May 1948. After the Nakba, he was amongst those who formed the Fedayeen resistance in Gaza.

On 13 May at roughly 10 p.m. Zionist militia riding armoured vehicles approached al-Ma‘in. On the model we carefully placed twenty-four armoured vehicles, headlights on, approaching the village.[58] Coming from the east they first encountered the school building, Salman explained as the vehicles were moving across the model. From the school’s rooftop, the villagers fought to defend their land. There were ten to fifteen riflemen in al-Ma’in. Salman’s cousins shot from the roof of the school until their gun overheated and jammed. The Haganah forces overwhelmed the defenders. Salman’s cousins ran for cover. On the north-east corner of Salman’s father’s orchard, the gap in the cactus fence, leading to the source of Wadi al-Ma‘in allowed them to escape. Soon afterwards, the rest of the family tried to join them. ‘Women and children ran in a northerly direction. Mothers tried to locate their children in the darkness. They tried hurriedly

to pick up things their children needed: milk, blankets, and the like. In the background, the threatening lights, the hail of bullets tracing arcs in the sky, the hurried confusion, the agonising cries, and the shouts for a missing child heightened our fear of impending death. My mother led my sister and me in the darkness.' The family assembled in Wadi al-Ma'in. 'I knew this wadi well; it had steep sides that were several times my height. It was a place where I often hid and went on wild adventures, with galloping horses, monsters, and demons.' In the wadi 'the women splashed dirt on their faces to discourage rape'.[59] Salman, immersed within the virtual environment of the model, traced his way to the wadi. He turned around to recreate the last look he had of his village. Peeking over the edge of the wadi in the simulated break of dawn, Salman reconstructed what he saw. He instructed the team to model high smoke plumes. One by one the structures of the village were exploded or torched. One plume he located by the school his father built, another where the well was located. 'At 6 a.m. they blew up the house of Sheikh Hussein, not before they stole gold, papers and photographs as well as a large ceremonial sword. They blew up the old and new school buildings, burnt the tents. Destruction was complete at 10 a.m.' Altogether there were eight billowing columns of smoke. 'Please make the smoke pillar higher,' he asked FA researcher Agata Nguyen Chuong, who modelled live as he was telling the story. The tents were made of wool and the fire made a lot of smoke. 'This is exactly the view I remember,' he said as he stared at the screen.

A digital reconstruction of the path taken by Salman's cousins as they escaped through a gap in the cactus fence, leading to the source of the Wadi al-Ma'in.



The last view Salman had of al-Ma'in from Wadi al-Ma'in as the village was destroyed. The plume selected (yellow) is in the process of being enlarged to accurately capture Salman's memory image. Forensic Architecture and Salman Abu Sitta, 2025.

Like many other Palestinians in 1948 the family walked into exile. They arrived on foot in Khan Younis, no more than five kilometres away, and stayed with acquaintances there for a while. Salman's father sent him to Cairo with his brothers to study 'until things calm down'.

Several soldiers have written of their surprise at what they found in the village they had just conquered. Beni Meitiv, an Arabic-speaking intelligence officer in this area, wrote: 'The Abu Sitta house was a two-storey-high concrete and stone building, decorated by marble columns and column heads from the remnants of a Byzantine settlement in this place. A large blossoming garden and a well.'[60] When we read out this text, Salman told me that this description is the 'fantasy of a spy and an orientalist. No house in this area was more than a single storey in height and there were no Byzantine columns.' The other description, by Aharoni, Salman found more credible. 'We went to Abu Sitta's house and were struck: in the heart of the desert, unbelievable richness: fancy furnishings, an abundance of oriental and European clothes, radio, a truck, a decorated silver Bedouin sword, a large and significant archive of documents and photographs, letters from the Emir Abdallah and Hassan Bana, the leader of the Muslim Brotherhood in Egypt; a lawyer certificate of one of the family members, Shakespeare's *Othello* in original version, near the Quran.' The excitement knew no bounds when they found the weapon storage: 'A number of ammunition boxes, a few guns and two boxes full of Italian explosive material. We were so happy.'[61] This description was retrieved by Uri Davis, an anti-Zionist activist and close friend of Salman, who, at his request, tried to locate without success Sheikh Hussein's sword.

The British Mandate terminated as the clocks hit midnight on 15 May. The following morning, the armies of Egypt, Transjordan and Syria rolled into Palestine to intervene on behalf of the Palestinians. The Egyptian army progressed along two axes, the Beersheba–Hebron route and the coastal route, past Gaza City towards Jaffa. It established its headquarters in Gaza City. After its occupation of al-Ma'in a convoy of about half of the Haganah force proceeded towards Kfar Darom, where it fell into an ambush by a combined force of Muslim Brotherhood volunteers and the Egyptian army. The convoy, which overnight became Israeli as the state was founded, took casualties and retreated. The outpost was later overrun, one of the few Jewish settlements to be

occupied during the 1948 war.[62]

Nakba in Naqab

On 27 May 1948, Egyptian soldiers caught two Israeli soldiers near a well north of Gaza City. They admitted to throwing typhoid and dysentery microbes into the water. They were tried, convicted and hanged in the Rimal neighbourhood of Gaza.[63] A similar attack had been conducted three weeks earlier on the water system of the Palestinian town of Acre north of Haifa, and in village wells elsewhere. The rumour about the poisoned wells spread fast. The Egyptian army devoted much manpower to guarding wells to stop soldiers drinking from them. In the following months the main battle lines moved elsewhere. Salman's cousins returned to al-Ma'in and managed to harvest some of the crops. They did so like many other Palestinians in defiance of the war and the new geopolitical realities forming on their lands.

The ethnic cleansing of Palestinians progressed systematically southwards, with the Israeli army, formed on 26 May, occupying, burning and destroying village after village, often conducting massacres as they went along. In the morning of 11 July 1948, Israeli aircraft dropped leaflets on the cities of al-Tira, al-Lydd and Ramle, calling upon the people to leave their city 'before it collapses on their heads'.[64] At noon the Israeli army commenced its assault. The expulsion orders were given by former Haganah, now Israeli, army commanders Yigal Allon and Yitzhak Rabin. Those who sought shelter in the Dahmash mosque in al-Lydd were massacred by the Israeli army. Seventy thousand people were forced to march into exile. In the summer heat, many died on what were called the 'death marches'. Tens of thousands made it through the Egyptian lines into Gaza. On 14 July the Negev Brigade reported that the village of Simsim north of Gaza was occupied and its population expelled. 'The wells were sabotaged, and anti-vehicle and anti-personnel mines were laid,' the brigade reported.[65] Attacks and expulsions in and around Gaza paused

and did not resume before the middle of October 1948. The village of Isdud along the coast fell on 28 October. Beersheba, on the southern tributary of Wadi Gaza, had fallen a week earlier. It was the last Palestinian town to fall. When the Egyptian garrison in Beersheba retreated towards Gaza City, the area was left without protection. Beersheba, which served as an administrative centre and a local market for the area, was looted by soldiers. Members of nearby kibbutz settlements stole 'tractors, and farm equipment' and argued over the grains in the silos.[66] On 3 November 1948 the army was ordered to drive away the area's 'Bedouin population'.[67] West of Beersheba, hundreds of farming villages located along the tributaries of Wadi Gaza's basin were forced to march down the stream-beds. Expulsion lasted until December 1948. The majority of the al-Tarabin and al-Hanajrah were expelled to the area that became the Gaza Strip where tribe members existed. Al-Tiyaha was split in two: some were expelled to Gaza and the others upstream to the Hebron area. After 'the Egyptian soldiers and civilians escaped through the wadi towards Gaza', wrote an Israeli soldier who observed the exodus, 'the Negev was cleared of all villages'.[68]

The tributaries gathered into the mainstream of Wadi Gaza some eight kilometres from the Mediterranean coast. Along the estuary of the stream were several tribal communities which offered the displaced clans some temporary shelters. From around 100,000 Palestinians in the Naqab only some 13,000 remained in the area under Israeli control.[69] Ethnic cleansings continued in the area north of Gaza City. On 25 November 1948, the army issued 'operational order number 40' instructing its forces to collect the inhabitants of the area, load them 'onto vehicles, and expel them to Gaza'. To prevent their return, the order instructed soldiers to burn 'the villages and destroy their stone houses' as well as to 'mine the roads leading to these villages'.[70] Wells were destroyed or poisoned. At the end of December 1948 the army invaded al-Ma'in for the second time, expelled the few family members that had returned and established an outpost near the house of Salman's uncle, Abu Ibreisha, just south of the

main crossroads.

Expelled Palestinians did not believe their displacement would last long. Almost immediately after arriving at their place of exile, with the battles still raging, individuals and families tried to walk back to their villages to look for relatives, salvage belongings or harvest crops they had planted. Shepherds returned with what remained of their flocks to graze the areas they had used before. Acts of return took place well before the 'right of return' was voted on in the UN in December 1948 and enshrined as a central Palestinian demand. Some returnees bore arms and sought to expel the invaders or exact revenge, though at that time these were not coordinated acts of resistance and lacked strategy.[71] To move undetected, many of the returnees walked up the same stream beds they had come down on, finding their way up the wadi's splintering tributaries. The growth in the wadis offered some hiding and remained the most distinct feature within a landscape that was in the process of being rapidly transformed. An Israeli soldier recalled being part of a force ordered to block the return of Palestinians walking up the stream beds. He said that his unit was 'placed on a commanding hill, overlooking Wadi al-Seba, two platoons, two jeeps, with machine guns. Our role was to block the wadi from people walking back into our territory upstream,' and 'to block', he clarified, 'meant shoot to kill without distinction'.[72] Israeli perception was that Palestinians were returning 'mostly in order to harvest fields we didn't have time to burn'. Nahum Sarig, Negev Brigade commander, ordered the burning of crops, the demolition of houses, the cutting down of trees, and the removal of landmarks. Palestinians should have nothing to return to.[73]

By the time ceasefire was reached at the turn of 1949, Egyptian forces still held on to forty kilometres of the coastal road connecting the border town of Rafah, Gaza City and the villages of Jabalia, Beit Lahiya and Beit Hanoun in the north. All in all, Abu Sitta recorded, close to 200,000 inhabitants of 247 Palestinian cities, towns and villages were expelled into and concentrated in the coastal enclave controlled by the Egyptian

army – a stretch of the southern coastline slightly larger than 1 per cent of Mandatory Palestine. The enclave had a prewar population of 80,000. According to the Jerusalem-born historian, politician and administrator Aref al-Aref, in 1943 Gaza was a large town of 33,000 inhabitants – only slightly smaller than Jerusalem – with the main neighbourhoods of Old Gaza, al-Daraj, al-Rimal, al-Zaytoun, al-Tuffah, and Shuja'iyya.[74] The original inhabitants were as diverse as anywhere in Palestine: urban traders, politicians, land-owning families, writers, educators, administrators, farmers, semi-nomadic pastoralists, Egyptian port-workers, textile, glass, soap and ceramic producers. There were several wealthy and influential families who controlled most economic and social institutions and played significant roles in the administrative and political life of the town and the region. Al-Aref noted the presence of modern professionals: two engineers, eight lawyers, in addition to four Sharia (religious) lawyers, eight doctors, and a chemist.[75] The towns of Rafah, Khan Younis and Gaza were important stops along the 'desert corridor' which led from Alexandria and Port Said through al-Arish to Jaffa and Jerusalem and further to Damascus. The barley sold in Gaza's market supplied the more arid stations along the desert corridor and pilgrim routes. Gaza had a Christian community. Its Jewish community, which was central to the barley export to Europe and was not Zionist, reluctantly agreed to be evacuated by the British police to Tel Aviv after protests and riots erupted in 1929 over Zionist migration. The few remaining members left in 1936 when Palestinians rose against the British authorities' support of Zionism.[76]

In the towns of Gaza, Khan Younis and Rafah, refugee families and villages were trying to remain together, gathering in railway stations, in the streets, in mosques, in schools or in the open dunes along the shoreline. Some found shelter with family members or business associates. In the following years eight refugee camps were built by the UN Relief and Works Agency (UNRWA), established in 1949. The Red Cross opened food distribution centres. Those in Deir al-Balah, Khan Younis and

Rafah were bombed by the Israeli air force in January 1949 while ceasefire negotiations were taking place. Israel wanted the refugees to continue south past Rafah and into Egyptian Sinai. But Palestinians held on to this toehold of Palestine, and Egypt would anyway return into Gaza all refugees that made it to Egypt.

More than 2,000 Palestinians in al-Majdal and Asqalan were not expelled during the war. They were enclosed in what Israelis called the 'Ghetto'. The last were expelled in December 1950 well after the end of the war. Some of the remaining Bedouin communities were expelled into Gaza and the West Bank even later, throughout the 1950s.

In aerial images from 1945 that Nour and I examined we could see the south bank of Wadi Gaza occupied by three large British military installations, which were established before the EEF invaded northern Palestine in March 1917. In al-Nusseirat, near the coast, we could clearly see the a military base and a large prison. In the winter of 1941–2 it was the first refugee camp in Palestine, housing Greek refugees from the German occupation until 1945.[77] Another British base further east along the banks of the wadi was in al-Bureij, Nour's birthplace. In the area of al-Maghazi the aerial image shows a grid of C-shaped earthworks, each being a weapons cache. Mohammed Abujayyab, who grew up in al-Maghazi, said that the name of the camp came from the English word magazine, itself a derivative of the Arabic *makhazin* meaning storage facilities. The British bases of al-Nusseirat, al-Maghazi and al-Bureij were abandoned when the British forces left in the spring of 1948. UNRWA repurposed the infrastructure of these bases as cores for refugee camps. The refugee camp of Rafah was also established around the core of the evacuated British military base within that city. The four other refugee camps were set up on the open sand dunes, areas which were not cultivated or privately owned and thus areas UNRWA could more easily get hold of. The Jabalia refugee camp was located on a large dune near the farming village of Jabalia. Al-Shati, or Beach Camp, was set up on a sandstone cliff over the seashore. On the aerial images we could see that both camps were built on areas

that in 1945 were planted with trees. The Mandatory authorities had used these small forests to hold the sand dunes in place. In later aerial images we saw the trees had disappeared. The refugees had cut them down for fuel. The camps of Khan Younis and Deir al-Balah were placed on the dunes close to the town centres.

In Gaza refugees mixed and intermarried with the local population with whom they had customs and language in common.[78] Hybridity was also reflected in the architecture. UNRWA constructed the camps along a grid of prefabricated or concrete-block buildings with pitched tin roofs, each with a small yard. Some refugees were housed in remnants of British military prefabricated wooden huts. In the early years of displacement, *shegs*, the traditional Bedouin hospitality tents, were set on the margins of these camps. Later the function was performed within the open ground floor of homes several storeys high. All this meant that over the years, the social and urban borders between the camps and the city eroded faster than they did in the refugee camps built in Syria, Lebanon or Jordan.

The Spoil

Annual dust storms from the Sahara Desert – known locally as *khamaseen*, the Arabic word for fifty, after the approximately fifty-day period during late spring and early summer in which the wind is most prevalent – carry with them large quantities of organic dust from forests and lakes, long dried in east Africa. Slightly heavier than air, the particles are visible as a slow-moving mist. When the organic dust descends, it covers the shallow hills of the Wadi Gaza basin, and stimulates the activity of bacteria and fungi. Earthworms mix it with the soil deposits coming with the wadis and the sand washed from the sea. The resulting yellowish-brown mixture is a soil known as loess, named by the German scientist Karl Cäsar von Leonhard, who used the German word *Löss* ('loose') to describe its characteristics. Loess is a highly mineralised soil, easy to plough and replenish. Because it

has a good water retention capacity it allows for cultivation in drier climates, and is the perfect medium for wheat and barley. During the British Mandate, Zionist agronomists already coveted the loess plains for the benefit of Israeli agrarian settlement.

In 1949 Yigal Allon, the commander of the southern front of the Israeli army which occupied and ethnically cleansed the Beersheba district, convened a seminar aimed at convincing his officers and soldiers to settle the areas they had just occupied and depopulated. 'So far the Negev is ours but only in a military sense,' Allon told his troops. 'A huge empty territory created by the escape of tens of thousands of its inhabitants.' This land was strategic because the war could resume at any moment and 'because of the huge number of refugees whose eyes are focused on this land. We will not be able to hold on to the Negev,' he continued, 'without the most important soldiers of the land – settlements, workers, clerks, managers.'[79]

Alon invited his mentor Yosef Weitz to help convince the soldiers. He introduced Weitz in his typical dry manner as 'the person in charge of land acquisition and settlement, who had dedicated most of his energy to the future of the Negev'. Ukraine-born, short, slight and bespectacled, Weitz seemed like a small-time political apparatchik, especially when contrasted with Alon's troops, but he was one of Zionism's most effective colonial administrators. He was the director of the Jewish National Fund's Lands Division which, since the 1930s, was responsible for land acquisition from Arab landowners for the benefit of Jewish settlement. In 1943 he was involved with the Jewish Agency's Department of Soil Chemistry (after the establishment of the state he became the director of its successor, the Israel Soil Development Council). It was the 'soil department' that set up the three research outposts in the Negev. Each outpost undertook deep borings at various points around them to map the soil strata. Botanists tested the suitability of different soil types for the cultivation of different species and meteorologists measured the amount of rain and produced detailed maps.[80] Soil, like climate, might be familiar to those inhabiting the land, but elusive to

those trying to map it. In the Beersheba district, alluvials, clay, sand and loess continuously intermix and recompose, making new soil types and redrawing the boundaries between existing ones. Soil maps are like trying to fix clouds. No two were alike.

Weitz was planning to settle the Negev well before it was occupied and depopulated. He was also known both as 'Father of the Forests' and 'Architect of Transfer', the former for his work on afforestation, the latter because he was chairman in 1948 of the three-member Transfer Committee that acted as experts on the expulsion of Palestinians. Later the two jobs would connect when he advocated for the planting of forests over the ruins of Palestinian villages. Weitz gathered information about the early twentieth-century population transfers of Armenians, Greeks, Kurds and Turks. Throughout the 1948 war, Weitz continuously encouraged Alon, as he did with other military officers and with the political leadership, to complete the expulsion of Palestinians from all occupied areas.

'We will hear from Weitz a lecture on the settlement plan and the development of the Negev in order to make it ours forever,' Allon said.[81] Weitz's lecture began by defining the Negev as the desert threshold that begins at 'the line that starts where Wadi Gaza pours into the sea and follows the stream'.[82] He then lovingly talked about the unique quality of loess, and described the difficulties of buying land in the Negev during the time of the British Mandate. Each plot he wanted to buy was 'collectively owned by thousands of people'. 'They did not sell their lands; it was impossible to buy the Negev parcel by parcel.' He said he understood then that it fell to 'the army to acquire the Negev in a war'.[83]

To defend the lands to be occupied, he had another idea. 'Immediately after the UN partition plan was voted on [November 1947] I had a dream of how to settle and build lines of defence along the borders,' Weitz told the soldiers. 'I thought we needed to create a new unit in our army to achieve this unique goal, not only occupation of the territory but also occupation of the soil. After the Negev was conquered by sword, we will later need to

conquer it with a pickaxe and the plough.' Weitz was obsessed with soil. On 13 July 1948, the day after Israeli soldiers conducted a massacre at Dahmash mosque and expelled the inhabitants of the town of al-Lydd, he took soil samples near the town and marvelled at the 'rich brown-black-red soil' they left behind, which was 'a treasure', he noted in his diary, for Jewish agrarian settlements. He likewise went on to tour other Palestinian village sites after they had been depopulated to determine the kind of soil they stood on and its potential use.

In September 1948, he advocated for the expulsion of Palestinian Bedouins from the Beersheba district through non-stop 'intimidation using all means'. These farmers, he thought, should never be allowed to return.[84] After the expulsion, he was surprised at the refugees' insistence on returning to their lands. 'Maybe,' he wondered, 'it lies in his rootedness. After all, he and his kind have been bound to the soil…for generations.'[85] Weitz thought that one of the tasks of Jewish settlements was to break this bond between Indigenous people and their soil.

In the 1949 lecture Weitz lamented the fact that some 'ten thousand Bedouins remained in the Negev. It is impossible to start an extensive cultural settlement plan while the Bedouins are there…We need to solve this problem in an elegant way and concentrate them in one part of the Negev that we cannot irrigate.' He also wanted to 'turn them into permanent dwellers [because] these nomads are a hazard to a cultured state'. The first official census of the Arabs of the Negev found their numbers in 1951 to be about 13,000, most of whom were from the al-Tiyaha tribe with a few remaining clans from al-Tarabin and al-Azazme.

The Emergency Defense Regulations Israel put in place in 1948 prohibited the Palestinian Bedouins who remained in the Negev to get within ten kilometres of the armistice lines around Gaza. In 1952 the few remaining Bedouin communities that held on to a few of the tributaries of Wadi Gaza were driven, as Weitz suggested, into an arid and saline area known in Arabic as the *siyaj* – the enclosure – which was placed under military rule. Under the military government, any exit from the *siyaj* required a

permit. It functioned somewhat like a Native American reservation in the late nineteenth century.

The expulsion freed the entire Wadi Gaza basin for Jewish settlement. The placing of Jewish settlements along the tributaries of Wadi Gaza was meant to block Palestinians from returning to their lands. The communities expelled into the *siyaj* were unable to cultivate the dry area they were confined to and starvation ensued. Former farmers were forced to seek manual jobs in the fields of the Jewish agricultural settlements, and in later years in the Israeli military, where they performed duties as trackers and as an interface with the Palestinian populations of Gaza and the West Bank.[86]

Despite his contempt for Indigenous agriculture, which he saw as backward, Weitz also sought to learn from it. He observed how 'the orchards cultivated by the Arabs seem extremely fertile' in a relatively dry climate. This, he said, was due to the loess's ability to hold moisture. This is the reason that at the threshold of the desert the local farmers cultivated plants that are otherwise found only further north. The loess, he reiterated, 'will enable settlements where little water existed'.

Weitz ended with a plea to the soldiers: 'how many of you officers who conquered the Negev are willing to conquer the soils of the Negev, its huge expanses of lands, its ways and waterways? So that we can establish what we need – 120 settlements.'[87]

Kibbutz settlements (originally in purple, here in yellow) printed in 1955 over a 1947 British Mandate Survey Map. From north to south: Re'im, Kissufim, Ein HaShlosha, Nirim, Magen. The three southernmost settlements were built over the lands of Ma'in Abu Sitta. Under the circle marked Nirim, one can still read the designation 'Karm Abu Sitta' – the Abu Sitta's orchard. The thick grey line on the left is the armistice line.

The Lines

Armistice talks between Israel and Egypt started on 2 January 1949 on the Greek island of Rhodes. Agreement was reached two months later, on 24 February 1949. The UN negotiators attempted to separate Israeli and Egyptian forces around what was then still called the 'Gaza–Rafah Area'. The armistice

demarcation line was drawn three kilometres east and parallel to the historic traffic artery, today's Salah al-Din Road, connecting Rafah and Gaza.[88] The Israeli forward positions were held to three kilometres further east where the agreement allowed for only six small outposts, each a platoon of twenty to fifty fighters in size. The agreement document provides their coordinates; most were on top of the third sandstone ridge. One of these, as Salman Abu Sitta carefully mapped, was the centre of the crossroads of al-Ma'in. Between the forward Israeli outposts and Egyptian lines a buffer zone, three kilometres wide, was left between the armies. This zone – previously home to dozens of villages, homesteads and farms – was now abandoned.

The armistice agreement was technical, provisional: the lines simply designated the separation of forces and, as the agreement emphasised, were 'not to be construed in any sense as a political or territorial boundary'. The path of an eventual border was left for further negotiations.[89] Both the Egyptians and Israelis were not in a hurry to establish an international border because both were eager to improve their positions. David Ben-Gurion, Israel's first prime minister, wanted the final borders to be decided when war resumed, giving Israel another opportunity to occupy this small Egyptian-controlled enclave along the coast and expel its population to the Sinai.[90]

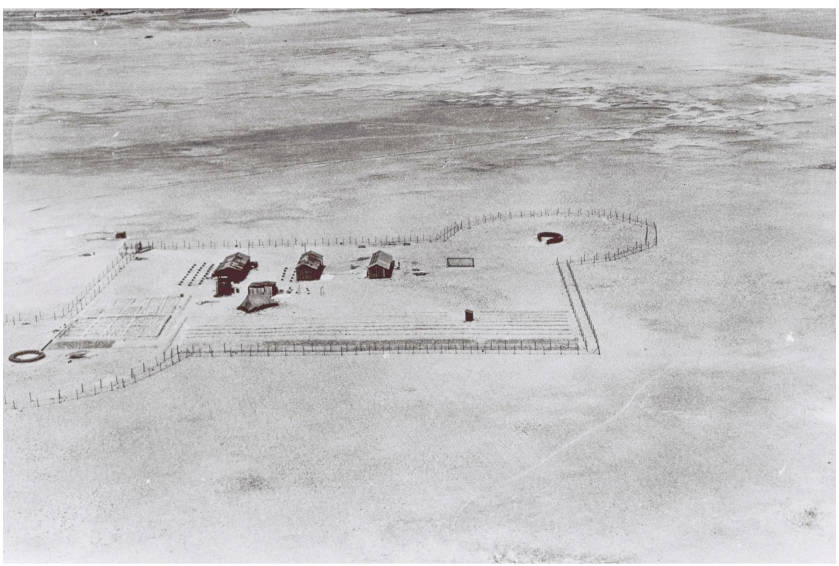
Alongside the six military outposts stipulated by the agreement, the Israeli government began in early 1949 to establish agrarian settlements along the entire frontier lines and populated them with armed settlers. The settlements, several of which were within the buffer zone, started expanding Israeli territory through cultivation. The outposts cultivated some 200 square kilometres of the buffer area west of the six coordinates that the 1949 armistice agreement established as their forward position. 'The border will pass with the last furrow', ran the Zionist slogan, and the settlers ploughed right up to the Egyptian army's forward lines. Israeli agrarian geometry was different from that of the area's previous inhabitants: their fields were larger, their grid abstract and orthogonal. Cultivation established more

than a claim to the land: ploughing was a mode of erasing traces of Palestinian inhabitation. Settlers ploughed their fields in the opposite direction to the way Palestinians ploughed theirs. The plough blades went over the remnants of homes, roads, fields, rubbing out Palestinian existence. They also drove their ploughs over cemeteries because these were places to which expelled Palestinians returned. 'Here in the Gaza Envelope, those who determine our sovereignty are not the tanks, but the tractors,' the secretary general of the kibbutz movement reminisced after 7 October 2023 about the national significance of the settlements attacked.[91] The systematic erasure was Israel's way of laying claim to newly occupied lands and flaunting international pressure that demanded the return of Palestinian refugees.

Ungrounding extended from the territory to the maps. In early 1949, a few months after the armistice agreement was signed, Ben-Gurion asked a group of historians, surveyors and biblical scholars to create a new Hebrew Map for the Negev changing Palestinian place names to Hebrew. The Governmental Names Committee replaced the names by which hundreds of wadis, hills and roads were known over generations with Hebrew-sounding names that usually sounded similar to the Arabic originals. This was based on the myth that the Arabic names were themselves derivatives of ancient Hebrew place names. Taking a British topographic map as a base, the Arabic names of Wadi Gaza tributaries were overprinted with Hebrew names that on this occasion did not ring like the Arabic ones, but reverted to biblical stream names that may or may not have been in these locations. Wadi al-Sharia turned into Nahal Gerar, Wadi al-Seba and the Wadi Gaza estuary were labelled Nahal Habesor. Palestinian villages were overprinted with stamp-like signs reading 'abandoned'.[92] Another set of maps overwrote one geography with another. Purple circles and dotted lines printed in 1955 over the British maps marked the location of settlements and the roads that connected them like beads on a thread.[93]

After erasing the traces of their previous existence, Israel could claim that Palestinians had never inhabited these places. At most,

it was an empty land briefly traversed by nomads.[94] This conception was translated into a legal strategy that governed dispossession. It was based on an environmental fantasy that was tautological, self-serving and went against all evidence. Israel considered the Negev to have been a desert before their occupation and settlement, and desert environments, they claimed, do not allow for permanent settlements. Consequently, the Bedouins must have been nomads, and nomads possess no land rights. Based on an imposed distinction – spatial and conceptual – between barren and cultivated lands, the 'Negev' became a vast zone, half of Israel's total land area, within which no Palestinians had any property rights.[95]



The kibbutz outpost of Nirim shortly after its establishment in 1946. The kibbutz remained in this location (known as 'Dangour' after the Jewish Iraqi family that owned the land) from 1946 to 1949. In April 1949 the core of the kibbutz moved to settle the evicted ruins of Ma'in Abu Sitta and this outpost became a military base where the rape and murder of an unnamed Palestinian girl took place in August 1949. Zoltan Kluger, 1946.

The White House

The first military-agrarian kibbutz outpost placed on the Abu

Sittas' lands was called Nirim – 'ploughed fields' in Hebrew. Like many kibbutz settlements the name was that of a specific group of settlers – a nucleus – formed and trained to establish frontier outposts. Al-Ma'in was not the first site the Nirim nucleus attempted to settle. In late 1946 they first settled in an area known as Dangour named after the Jewish-Iraqi family that in the early twentieth century did manage to purchase land close to Rafah and the border with Egypt. The Nirim outpost in Dangour included four wooden huts, a security house, a small shack for showers and another for toilets, and a large shed for farm animals. On 15 May 1948, when the Egyptian army crossed the border with Palestine in Rafah, Nirim was the first Israeli outpost it encountered. They shelled it heavily, but the Egyptians did not manage to break through its barbed-wire fencing, and the outpost was not occupied. Its dozen or so settlers managed to remain in place throughout the war of 1948 in underground bunkers, tunnels and trenches dug through the area's sandy loess soil which lent itself to tunnelling (the Palestinian tunnels would also evolve within the same soil). They developed periscopes to bring in light and survey their surroundings.[96]

In April 1949, two months after the armistice agreement, the Nirim nucleus sought to change the location of the settlement. Large tracts of territory became available after the expulsion of its Palestinian population and the settlers started touring the area by foot in search of 'the rain line' – the elusive and ephemeral line north of which the amount of annual rain starts allowing for cereal cultivation without artificial irrigation. They walked northwards, paying attention to small changes in vegetation. Twelve kilometres north of Dangour they reported encountering fields of wheat and barley that in April must have already been at full height and close to ready for harvest. The presence of wheat there confirmed that members of the Abu Sitta family had managed to sow the fields during the war, in the fall or winter of 1948, shortly before they were expelled, Salman Abu Sitta told me when I shared this account with him. The settlers marvelled at an orchard 'yielding fruit trees that were abandoned by the Arabs

from the “Abu Sitta” clans’.[97] The settlers, at that time, still knew the name of the people on whose land they settled. The orchard they encountered was that of Salman’s uncle Abu Ibreisha. The settlers decided that the wheat fields and the orchard meant that the site was at or over the ‘rain line’, and chose the place as the location for their settlement. They noted a large building left standing a few hundred metres south of the al-Ma‘in crossroads. The settlers called it ‘the White House’. This was Abu Ibreisha’s concrete building, one of the first concrete buildings in the Beersheba district. The nucleus decided to use it as a temporary base until the government constructed their permanent settlement nearby. Around the White House they set up a few tents and prefabricated ‘Finnish huts’, each housing four people. The place was one of the six locations the armistice agreement of February 1949 allowed for military outposts. The settlers harvested the Abu Sitta fields. The land was taken ‘furnished’ indeed. Shortly afterwards the settlers found the well and the diesel pump. The engine had been blown up by the Haganah during the raid of 14 May 1948. Now the settlers sought to repair it. Mordechai Galili wrote in the settlement’s members’ bulletin called *Yahdav*, ‘Together’ in Hebrew, about his surprise when realising the well was ninety-five metres deep. He said he enjoyed the cool silence and worked for long hours in the dark.[98] He repaired the pump and the settlers managed to extract enough water to serve their needs for the following six months. Galili wrote the water was brackish. It is true that the deeper a well is, the more saline the water tends to be, because it is filtered through more layers of mineralised soil, though it is healthy enough for human and animal consumption. It is because settlers used the White House and the well that these structures remain on the landscape today. All other buildings were destroyed and their ruins ungrounded.

Nirim residents were trained and armed. ‘We had a total of thirty-four rifles and sub-machine guns, two light machine guns and one 52 mm mortar,’ Galili reported in *Yahdav*.[99] The outpost was fenced and trenches were dug around it, modelled on

the settlement in Dangour which was legendary for having withstood the Egyptian army's advance. The settlers mined the roads going west, north-west and south-west out of the Abu Sitta star crossroad going towards the armistice line. Galili recalled a sense of 'wilderness', a feeling of 'wild west' where the regional security officer was 'a kind of local sheriff'.[100] The settlers shot at all Palestinians that crossed into the buffer area between the armies. On 4 June 1949, Southern Command General Yigal Allon made local practice official. He declared an eight-kilometre-deep frontier along the ceasefire lines in which 'every stranger found will be shot without interrogation'.[101] The settlers shot at the returning Palestinians and confiscated the livestock – donkeys, mules and goats – that drifted past the armistice line. They shot camels because they did not know how to drive them. Galili wrote that the outpost came under frequent fire.

The 1949 ceasefire lines with Lebanon, Syria, Jordan and Egypt were almost 1,000 kilometres long and their path was meandering. Behind them was a deep 'frontier zone' that by the state's definition was roughly 40 per cent of the country. This zone was where Zionist colonial identity – the rough and rugged characteristics of armed and violent masculinity, as well as an intolerance towards law, decorum and morality – was formed. The colonisation of the desert's threshold was concerned not only with territorial expansion, but also with the transformation of the character of the Jew from one associated with cosmopolitan, urban culture, and strove to transform it into that of a native, setting down roots while expelling the area's inhabitants and exorcising the land from its past identity. Paradoxically this was often articulated by trying to mimic the manner of the Arabs they replaced. Though the outpost settlers received support, arms, equipment and infrastructure from the state, they imagined their form of life to be an alternative to the 'statism' of the centre with its administrators, stifling bureaucracy, petty traders and 'non-productive professions'.

The settlers stayed in the White House for nine months until enough of the infrastructure and built structures for their

permanent location was ready. The area prepared for them was three kilometres north of the White House, at the top of a sandstone hill marked 113 to denote its elevation. The area had fields belonging to Salman's father.[102] The water pipeline reached the area in late 1949 and in January 1950 the new location of kibbutz Nirim was settled. The year 1950–51 saw plenty of rain, enabling the expansion of Zionist agricultural cultivation all across Palestine. The settlers thought it was a divine sign, similar to the 'rain follows the plough' myth of American westward expansion in the nineteenth century.[103] When the settlers left their outpost in the White House the army took over the site and established there a small outpost.

The Rape

In April 1949, when the Nirim group left Dangour to settle al-Ma'in, the military started using the structures and fortification of the old Nirim settlement as an outpost, held by a platoon of thirty soldiers from the Sodom District Battalion who patrolled the armistice line. The platoon commander echoed Allon's standing order to shoot at anyone venturing towards Israeli-held territory. 'As far as women, the old and infirm, the exhausted, it doesn't matter at all,' a soldier later testified to the way the outpost commander's orders were communicated to the troops. 'The only exceptions are Jews.'[104] On 12 August 1949, patrolling near the armistice line, soldiers came across three Palestinians, two men and a girl. The Israeli records of the atrocity that followed exist only because the soldiers were court-martialled, though the trial took place behind closed doors, and the files only recently released. The story resurfaced in 2003. The court records do not mention any details about the victims. It described them as Bedouins but neither names them nor says where they came from.[105] In her short novel *Minor Detail*, Palestinian writer Adania Shibli recounted the incident from the perspective of the nameless girl.[106] The court records have the soldiers shooting at the camels and one of the men – the escape – and abducting the girl.

The soldiers brought the girl to the base, washed her in an outdoor shower, and chopped off her hair. The commander asked the soldiers to vote on her fate. The unit decided that she was to be raped and murdered. According to the trial testimony of one of the participants, most of the unit members took turns raping the girl, then drove her outside the base, stopped and started digging a shallow hole. In the trial one of the soldiers testified that the girl asked what they were doing and was told that they were digging her grave. The soldiers shot her – the court transcripts recorded the time of the execution as between 7.30 and 8 a.m. – and placed her body in the shallow grave. They scattered some sand over the body and later, at the request of one of the soldiers who worried that she might not have been 'fully killed', returned to shoot her again through the sand.[107] Twenty of the soldiers who took part in the rape, including the platoon commander, stood trial and were given light sentences, commuted on appeal.

The Trench Line

Displaced Palestinians did not always know where the forward positions of the Egyptian and Israeli armies were, and didn't care much. They kept trying to return to their lands, to harvest crops they had planted or to salvage some of their property; and this despite Israel's indiscriminate shoot-to-kill policy, the mining of the roads, and the erasure of all traces of Palestinian villages. The frontier was unmarked and Israel approached the UN claiming that 'frequent border incidents' required on-the-ground demarcation of the provisional armistice line.[108] In February 1950, a year after the armistice agreement had been signed, the UN brokered another arrangement between Israel and Egypt. The 'Modus Vivendi' agreement was a temporary technical territorial demarcation and not an attempt to fix the border. The path of the line was changed from the armistice agreement in two locations. After a geological survey, Israel discovered superior soil and underground waters in the north and traded it for the same sized area east of Khan Younis in the more arid part.[109] Besides that,

the UN and Egyptians seem to have accepted the facts established by Israeli agricultural cultivation in the buffer area and no longer insisted on restricting them to positions three kilometres away.

An Indian UN officer and a Palestinian shepherd on the Gaza side of the 'plough line'. The officer arrived to warn the shepherd against crossing the line. Israeli soldiers and settlers exercised a shoot-to-kill policy at anyone crossing the line. Livestock crossing was confiscated. UN, 1958.

In August 1950 the temporary line was demarcated on the ground as a one-foot-deep ditch.[110] Like the *pomerium* – Rome's first border – the boundary was to be drawn directly onto the territory by a plough (and like Rome's borders, from that point only expanded). Neither the Egyptians nor the Israelis nor the UN soldiers that were to participate in the demarcation were familiar with the region. They arranged to meet in the only visible

reference point – Wadi Gaza. Galili wrote in *Yahdav* that he and other soldiers drove down the dry stream bed until they reached a small, improvised Egyptian police post, manned by a single soldier. They waited for more than an hour for the Egyptian and UN officers to arrive and meanwhile shot an 'Arab cow' that crossed the invisible line 'to our territory' while grazing the dry grasses along the banks of the wadi.[111]

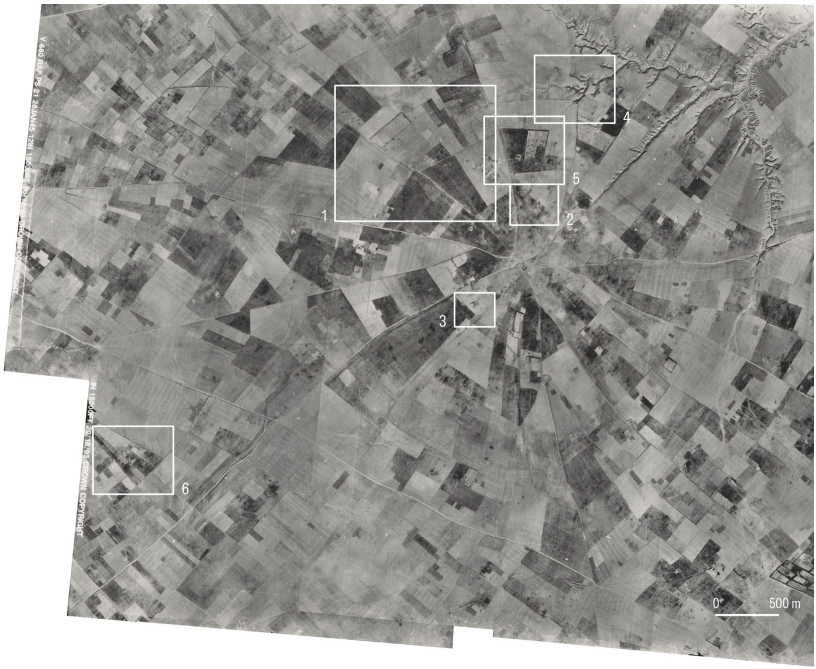
Here starts the scene with which this book began. The direction of demarcation was southwards, perpendicular to the wadi.[112] The further south the plough cut, along the Strip's forty kilometres, the more arid the environment became. East of Rafah it literally became a line in the sand. UN officers brought empty oil barrels to mark the ephemeral frontier. Salman recalled kicking the painted barrels, moving the border a few inches at a time. 'Why am I barred from my home by a fictitious line created by foreigners?' he wrote.[113]

The provisionary route carved into the ground became the current boundary of the Gaza Strip. Around the same time the so-called 'Rafah–Gaza Area' started to be referred to as the 'Gaza Strip'.

Before and After

We acquired a series of aerial images taken throughout the 1950s and 1960s by the nascent Israeli air force. We placed the images one over the other within a geographic information system (GIS) so we could flip between them and study, together with Salman, the changes over time. Much has happened between when the RAF aerial photographs were taken in 1945 and those taken by the Israeli air force in the early 1950s. In between the two aerial shots were the expulsions, killings and destruction of the Nakba and the cross-ploughing.[114] In 1945 the village of Ma'in Abu Sitta was there and in the 1950s it was ploughed over and ungrounded – it was hard to know how to superimpose the newer aerial images over those taken in 1945. Only the source of Wadi al-Ma'in, with its distinct fork-like shape, could anchor the later

images in place. Once the images were perfectly superimposed, we could notice a few traces that did escape the acts of ungrounding. The crossroads was gone, but three of its eight routes remained. In some places the territory appeared translucent. Once buried under several dozen centimetres of soil, the foundations of a building retain more moisture and make the vegetation that grows above it slightly but noticeably more robust. These buried features appear once a year and only for a short duration. 'Crop marks' reveal not only what is present, but also the subtle traces of what has been erased: the faint echo of ruined homes, walls, terraces and small agricultural installations. A few stubborn trees, bushes and cactus fences had also miraculously survived the Nakba, and remained surrounded by a completely foreign landscape. In the later images the buildings around the well, the engine and the silos were gone. The large house of Salman's uncle Abu Ibreisha was standing south of the crossroads, beside a small fruit orchard. In 1956 its roof was missing. Around it were two tents, a shed and a water tower. It is now a military outpost surrounded by a zigzagging trench and a fence. Galili wrote that he took the wooden beams from the roof to build a car repair garage in Nirim.[115]

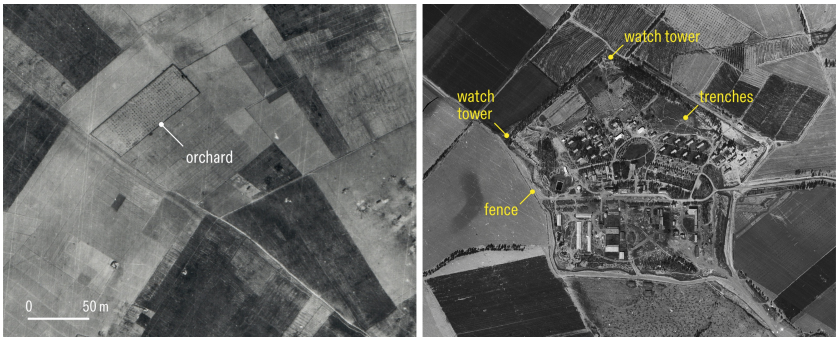


A composite of RAF aerial images capturing Ma‘in Abu Sitta on 28 January 1945.

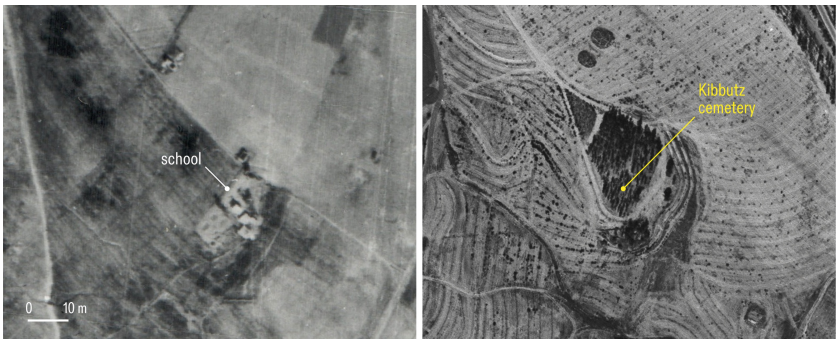
A composite of aerial images of the same area by the Survey of Israel in 1961. The pattern of fields and logic of cultivation has been completely transformed: the kibbutz settlements cultivated large open fields near the armistice line, offering an open field of visibility and fire. The rectangles on this reference image are enlarged with data from 1956 on the following pages.

A new paved road, Route 232, strung together the four new kibbutz settlements built on al-Ma‘in lands. Kibbutz Magen was the first to be established in August 1949 south-east of the crossroads on land belonging to the Abu Sitta family. Kibbutz Nirim was established, as mentioned above, in early 1950 on a hill north of the centre of al-Ma‘in. Kibbutz Ein HaShlosha was established three kilometres north of it in the same year on fields that were partially owned by Salman’s mother’s family. Kibbutz Nir Oz was established a year later in 1951 in the south part of al-Ma‘in on the land of Abu Ibreisha. The latter’s orchard is still visible in the aerial image, appropriated by the kibbutz members. The Israeli aerial images show the supposedly temporary demarcation of the plough line, clearly cutting through fields. East of the line are the huge geometric fields of the kibbutz monoculture. West of the line, inside the Gaza Strip, agriculture is denser: intensely cultivated small family fields, walled gardens and orchards.

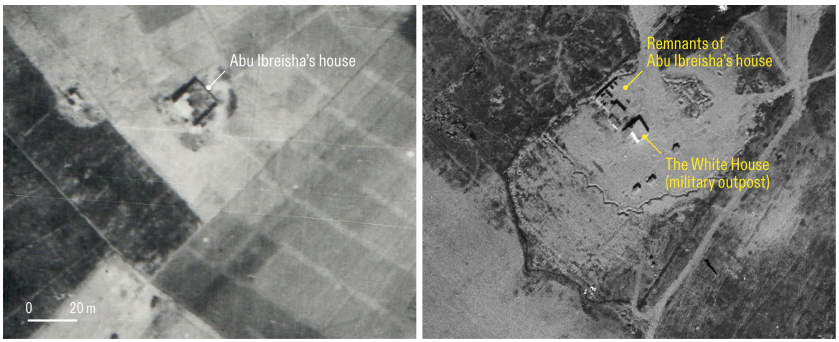
The erasure and transformation took place in the early 1950s. The remaining images from later in the 1950s and 1960s show merely a process of consolidation of the kibbutz settlements’ agricultural and industrial installations. The number of homes in the settlements did not grow much since the time of their establishment. All four of the kibbutz settlements built on the lands belonging to the Abu Sitta family were raided by Hamas, other Palestinian armed groups and civilians on 7 October 2023. In Nirim eight Israeli civilians were killed and five taken hostage, in Ein HaShlosha four civilians were killed. Armed residents in Magen repelled the attack. Nir Oz was the hardest hit of all the Gaza Envelope settlements. There, Palestinian fighters killed forty-seven residents and took seventy-six hostage.



1 The fields and an orchard belonging to Sheikh Hussein, Salman Abu Sitta's father (1945), overbuilt by the pentagon of kibbutz Nirim (1956).



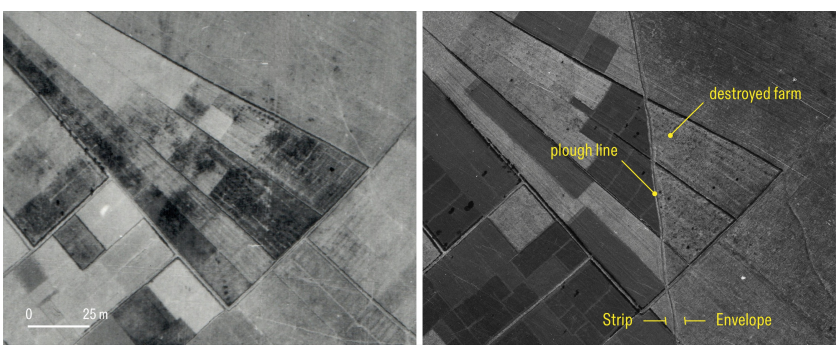
2 The school in al-Ma'in (1945) was destroyed and the area cross-ploughed and replaced by a small forest and cemetery of kibbutz Nirim (1956).



3 Abu Ibreisha's house (1945) became an Israeli military outpost (1956). In the middle of the outpost is 'The White House' which must have been built by Abu Ibreisha between 1945 and 1948.

4 Sheikh Hussein's house and his orchard (1945) overbuilt by Route 2410, or the 'Horseshoe Road' linking the three front-line settlements on Abu Sitta's lands.

5 A Palestinian farm (1945) is cut by the 'plough line' dug along the armistice line (1956). Abandoned, the eastern part of the farm dried up.



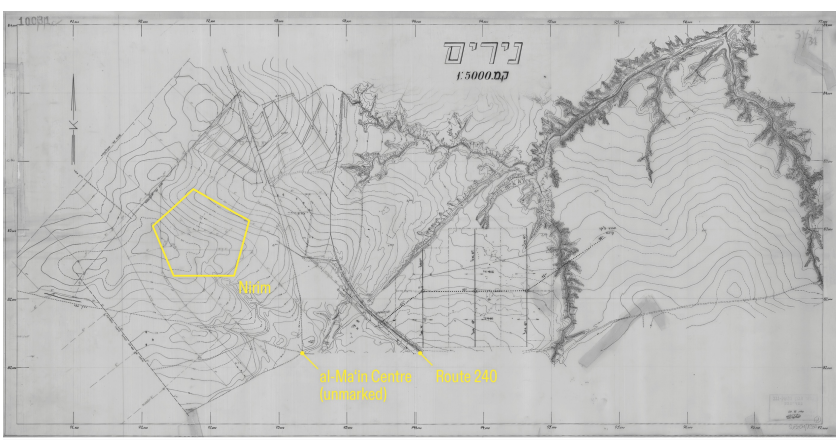
6 North-east of the village is the fork-like source of Wadi al-Ma'in, Wadi Gaza's southernmost tributary. It was the only recognisable link between the images of 1945 and those of 1956.

The master plan for the final location of Nirim was drawn by Shmuel Mestechkin, the Ukrainian-born chief architect of one of the two main kibbutz movements, Hashomer Hatzair, Hebrew for 'Young Guard', the more purist and Marxist of the two movements. In 1931, Mestechkin left Palestine to study architecture at the Bauhaus school, then under the direction of architect Ludwig Mies van der Rohe. The Bauhaus in Dessau was closed in August 1932, after pressure from the local branch of the Nazi Party and briefly relocated to Berlin.[116] Mestechkin returned to Palestine. His biography notes that his work was influenced by the ideas of the Swiss architect Hannes Meyer. As head of the architecture department, Meyer promoted a form of monotonous functionalism that sought to govern all aspects of life – from work to leisure, education to reproduction, cradle to grave – under the term 'Marxist Architecture'. Mestechkin did not study directly under Meyer, who by then had already been fired and had left for Moscow, but Meyer's functionalist approach had greatly shaped the Bauhaus curriculum. Upon Mestechkin's return to Palestine, he started working for the Haganah. There he oversaw the organisation's mapping office and gained expertise in the design of prefabricated fortification systems. Between 1936 and 1939, the time of the Arab Revolt against British rule and Zionist colonisation, Mestechkin helped develop the prefabricated system known as 'wall and tower settlements' – outposts meant to be erected overnight, on lands bought by the Jewish Agency in the middle of areas densely populated by Palestinian farmers. The fortification included a protected perimeter wall made of prefabricated wooden moulds filled onsite with soil and gravel and surrounded by barbed wire. For the centre of these outposts, Mestechkin developed a construction system for a guard tower made of long thin logs. Fifty-seven such outposts were constructed, the majority of which were kibbutz settlements. Wherever such seeds for colonisation were constructed the surrounding area would experience complete expulsion of its Palestinian population during the Nakba of 1948. Israeli architectural historian Sharon Rotbard wrote that the 'wall and

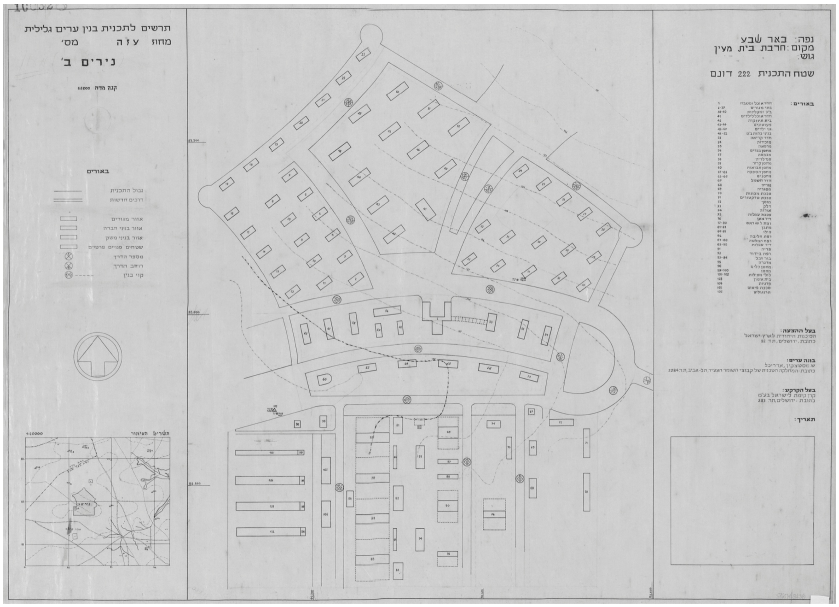
tower settlements' became the archetypes for Zionist settler-colonialism, and that its system of fast fortified construction has remained in the DNA of Israeli architecture ever since.[117] From 1949 onwards Mestechkin produced master plans for some sixty kibbutz settlements – a way of living where he believed Meyer's radical functionalist ideas could be best manifested.[118] He was also responsible for the smaller-scale architectural design of frugal dining halls, cultural centres, gym halls and schools in dozens of kibbutz settlements, according to documents retrieved by Natalia Sliwinska from our team. Mestechkin designed the House of Culture in kibbutz Nirim and a dining hall in kibbutz Magen, both on lands belonging to the Abu Sitta family.

Mestechkin signed the master plan for Nirim on 4 August 1949. Around elevation point 113, Mestechkin drew the perimeter of the settlement as a pentagon – a symmetrical five-sided polygon. The shape testified to the settlement's function as a piece of fortification. Since the fifteenth century the pentagon has been identified with the shape of defensive artillery fortifications and city walls. On hill 113, each flank was fortified with trenches, overlooking and controlling another part of the landscape around it. The corners had guard towers, the one closest to the trench line being placed at the crest of the hill. The guard towers were the same slim wooden structures as the 'wall and tower settlements'. Just as with these outposts, the fortifications were the first to be put on site, and when the perimeter was secured, the 'softer' functions like housing were put in place; the centre included the infirmary, the secretariat, the dining hall, the washroom, the House of Culture and the nursery.[119] A deep trench allowed for movement from the periphery into the interior. The communal dining hall, always the social hub of kibbutz settlements, was assembled from a prefabricated kit coming 'from the German import'. In 1949, the Jewish Agency bought second-hand kits previously used as temporary housing in the bombed out post-war cities of Germany. Later more kits arrived as part of the *shilumim* (the Hebrew term for German reparation payments for the Holocaust), which from 1953 supported Israel's state-

building project. On the side of Nirim's pentagon furthest from the frontier were the farm buildings, the industrial zone, the steel workshop, the carpentry and the garage, which Galili said was made from planks dismantled from the ruins of Ma'in Abu Sitta. Salman and our team have been trying to verify, unsuccessfully as yet, whether Nirim's cemetery used some of the stones from the Abu Sitta school building on whose ruins it stood. Regardless, it seems that parts of the settlement were certainly built from the ruins of its predecessor. In 1951 the kibbutz movement daily *Al HaMishmar* ran a report from kibbutz Nirim that described, Soviet-style, the settlement's progress. The kibbutz's eighty-six members cultivated '14,000 dunums of fields, with each dunum producing 70–80 kilograms of harvest, fifteen dunums of vegetable gardens, 180 dunums for animal feed, 100 dunums of orchards. We experimented with agave orchards for making threads for sacks, and put up a new cow shed for a hundred head of cattle. A new milking machine delivers 600 litres of milk daily. Two separate chicken coops for 2,000 birds each, with a daily harvest of 1,400 eggs.' The kibbutz's industry included a 'children's shoe factory'. The article celebrated regular gatherings of the choir, and a drama club. It also proudly announced a 'Marxism reading group'.[120]



A topographical map (1958) of Nirim with al-Ma'in removed. The south-west flank of Nirim (outline added in yellow) is on top of hill 113 overlooking the Strip.



The masterplan of Nirim by Shmuel Mestechkin/The Technical Department of Hashomer Hatzair for the Jewish Agency (undated, likely 1949). The plan noted the location as ‘Hirbet Beit Ma‘in’, a Hebraised version of al-Ma‘in.

Marxist Colonialism

Reading Marx on the ruins of an ethnically cleansed Palestinian village might sound like a contradiction, but Marx’s ambiguous views of colonialism left enough space for interpretation. For Marx, colonialism was a manifestation of the global capitalist system, an extreme example of the exploitation of labour and resources. Enslaved or deeply exploited labour put downward pressure on the conditions of the working class in the metropolises of colonising states. However, Marx’s and Engels’ theory of historical materialism also posited that social progress occurs in distinct stages, from primitive accumulation, through enslavement, feudalism and capitalism to the inevitable reign of socialism and, ultimately, communism. They thought that colonialism, though destructive and exploitative, could potentially

lead to such social progress.

The tension between Zionist colonisation and revolutionary politics was resolved through appeal to this principle of historical progress. Palestinian farmers were seen as backward and underdeveloped. The march of history depended on advanced European settlers improving the land. The proletarians of the world can wait for this process to be completed before they unite in a class revolution. The idea that settlers were a modernising force that would lead to the improvement of all, was oblivious to the fact that it was local farmers such as the Abu Sitta family who introduced a version of modernity to the area that also respected Indigenous culture. Zionist farmers studied the cultivation techniques of Palestinian farmers and often, as mentioned already, modelled their own manners and behaviour on them. Labour Zionism mixed socialism and biblical references. Moshe Dayan described how, as a young man, the Palestinian farmers, working their lands with a pair of oxen near the settlement of Nahalal, where he was raised, appeared to him like biblical figures displaced by time and made him think of his ancient 'forefathers and the heroes of our nation'.[121] Such a dynamic was analysed by Jewish-Tunisian intellectual Albert Memmi in his *The Colonizer and the Colonized.* After erasing the existence of the Indigenous inhabitants, on which they modelled their habits, settlers start imagining themselves as the real natives.[122]

All agrarian outposts and settlements throughout Palestine were affiliated with a political movement, and after the foundation of the state they were each represented by a political party in the Israeli parliament, the Knesset. Three of the four settlements built on lands belonging to the Abu Sitta family – Nirim, Nir Oz and Magen – were affiliated with the Young Guard, the kibbutz movement for which Mestechkin was the chief architect. The movement was founded in 1913 in an attempt to fuse Marxism and psychoanalysis, and was known for exercising complete control over the shaping of members from childhood to maturity. In its early years the Young Guard refused to endorse the Zionist movement's goal of the creation of a Jewish state in

Palestine and seemed to favour the idea of a binational state. Its members spoke of the fellah, the Indigenous Palestinian farmer, as their class ally, equally exploited by capitalist forces and rich absentee landlords. In January 1948, four months before the establishment of Israel, and while the Nakba was already in motion, the Young Guard formed a political party called Mapam, the Hebrew acronym for the United Workers Party. Furthest to the political left of all Zionist organisations Mapam was self-defined as a Marxist–Zionist party of pro-Soviet leanings. The party announced, without consequence, its opposition to the expulsion of Palestinians, on the grounds of equality and solidarity.[123] However, throughout the Nakba, Mapam members behaved no differently from other officers, soldiers and settlers. Mapam member Yitzhak Rabin, who as prime minister signed the Oslo Accord in 1993 as an icon of the Zionist left, was the deputy commander of the military force that occupied, conducted massacres in and expelled Palestinians from al-Lydd and Ramle. Most of the kibbutz and moshav settlements established after the Nakba around the Gaza Strip were affiliated with the larger, centrist Mapai party, which led Zionist institutions and the Israeli government for the first three decades of Israel's existence.[124] The kibbutz settlements affiliated with Mapai are generally located in the north of the Wadi Gaza basin. Mapam settlements received the southern, more remote and arid part of the Gaza Envelope.

After the Nakba of 1947–9 Mapam's Marxist ideology and colonial practice further diverged. Palestinian scholar Areej Sabbagh-Khoury notes that 'kibbutz discussions about the lands and properties of their former neighbours died down in the early 1950s. Normalisation of the disappearance of entire villages and their inhabitants took hold relatively quickly, and a significant gap opened between the formal political positions of their movement and the actions of settlers on the ground.'[125] In the rush for Palestinian land that erupted after the Nakba, the principle of solidarity with the fellahin was abandoned, and the Mapam-affiliated Young Guard movement demanded its 'fair

share' of the stolen lands of displaced Palestinians.

In 1947 the Soviet Union voted in favour of the partition plan and the establishment of Israel and in 1948 armed it, believing that their ideological alignment with the Zionist Labour Movement would put Israel on the Soviet side in the Cold War, but as soon as it began the Soviets shifted their support to the recently decolonised Arab states. The Young Guard and Mapam officially broke from Soviet and orthodox Marxism not because of the colonial question or the Soviet support of Arab states, but because in November 1951 one of the movement's founders, Mordechai Oren, was arrested in Prague en route to a conference in East Berlin. In 1952, he was one of several Jews charged in the antisemitic Prague show trials. In the wake of the trial, the kibbutz settlements of the Young Guard started banishing members who remained faithful to the Soviets. Galili said that these members 'undermined the foundation of our lives here'.[126] Mapam shifted towards a Zionist version of social democracy, one that fused socialism amongst its members with colonialism towards the displaced, Indigenous population. Still, the Young Guard settlers leaned strongly toward the Zionist left. That the movement's members are disproportionately represented in the Israeli Peace Movement and engage in human rights activism, while sitting on confiscated land, is a testimony to the blindness of Israeli society to the foundational injustice that stands at the heart of the Zionist project as well as to the difference between the traditional left–right divisions of the industrial societies and the settler–native divisions of colonialism.[127]

The Sharon Plan

In January 1948, during the early months of the Nakba, with most of the Palestinian towns and villages that would be cleansed still in place, Ben-Gurion established the foundation for the state's Planning Department tasked with designing Israeli towns and villages on as yet unoccupied land. Understanding the significance of physical planning he intended for the department

to be part of the future Prime Minister's Office, which he was about to inhabit.[128] Ben-Gurion appointed architect Arieh Sharon (not to be confused with Ariel Sharon) to lead the department. Like Mestechkin, Sharon was a graduate of the architecture programme at the Bauhaus, having studied there between 1930 and 1932 when the institution was under the leadership of Walter Gropius, and the architecture department, at least in 1930, was still under Hannes Meyer. Affiliated with the more centrist Mapai, Sharon returned to Palestine in 1931 to become a prominent architect of the Jewish Labour Movement, overseeing the design of housing projects, workers' co-operatives, hospitals and cinemas.

Sharon's task as the head of the Planning Department was to design a master plan for the new state. What came to be known as the Sharon Plan was published in 1951 in an illustrated format, under the title *Physical Planning in Israel*. It was not a legal document but a presentation of the principles by which the state would inhabit the occupied and emptied parts of Palestine. 'We have two important things at our command: a million and a half Jews, and all the territory in Israel. Most of the Jews dwell in a few towns; most of the land is empty and unploughed.'[129] 'Emptied' would have been more precise.

Architectural historian Zvi Efrat saw in the plan a central component of what he called 'The Israeli Project' – a programme of demolition and construction 'aimed at the total territorial and environmental transformation' of Palestine. 'Over the following two decades,' the project, Efrat wrote, 'will turn the entire country into a frenzied building, landscaping and refurbishing site.'[130] For this task Sharon recruited what he called a 'planning brigade', a team of 170 experts that included architects, town planners, engineers, sociologists, agronomists and economists. In December 1948, as the last wartime expulsions of Palestinians were still being carried out around Gaza, Sharon had already presented the government with the outlines of the plan.

He began by laying out the plan's general ideology. Using the idioms of hygiene typical of European modernist planners, the

essence of the plan was the replacement of the 'Old World' and its 'incurable chronic ills' with a new and healthy one. While for European modernists, the 'Old World' meant the historical cities with their squalid slums, for Sharon it came to mean two things: Palestinian towns and villages, seen as backward and primitive, and the petit-bourgeois urbanism of small domesticity and private ownership that evolved amongst the Jewish communities in the big cities of Haifa, Jerusalem and Tel Aviv, where two-thirds of the Jewish population in Palestine was concentrated. The Sharon Plan was based, according to Efrat, on 'derivative models, amalgamated theories imported primarily from England and Germany'.[131] Its principles were inherited from the 'Marxist Architecture' of Hannes Meyer, Soviet regional and town planning, and the New Towns constructed by Britain's post-war Labour government. The plan professed to present a rational and systemic new beginning and 'a fresh start on a *tabula rasa*'.[132]

The *tabula rasa* on which the Sharon Plan drafted a blueprint for the future state was produced by the Nakba.[133] The legal basis for expropriation was the Absentee Property Law of 1950 which allowed the state to seize control of emptied land and all immovable Arab property 'abandoned' by refugees. This expropriated land, some 90 per cent of the area controlled by Israel after 1948, was effectively transferred to the Jewish National Fund to hold on behalf of 'the Jewish People in perpetuity'.

Demographic distribution depended on infrastructure, and the master plan suggested the location of ports, a network of roads, electricity and water. From 1953 the infrastructure budget, amongst the highest items in the national budget, benefited from, amongst other sources, the *shilumim* reparation payments.[134]

The master plan had several stated goals: to provide homes for the waves of immigrants and refugees who were arriving in Palestine after the Second World War; to disperse the Jewish populations otherwise concentrated in the cities throughout the country's new frontiers; and, significantly, to establish the facts on the ground that would demonstrate to the world and to

Palestinian refugees, on whose land they settled, that return was impossible.

Formally, the Sharon Plan was based on a simple diagram in which agricultural settlements were the basic unit, bundles of which circled medium-size, semi-rural centres which were themselves assembled around new regional hubs or ‘development towns’, which in turn received services from the big cities. In this, Efrat claims, the plan betrayed another influence – the ‘Theory of Central Places’ formulated by German geographer Walter Christaller in 1939, which saw settlements and cities as functional hierarchical systems with villages surrounding larger towns offering goods and services. It is a surprising influence because during the Second World War Christaller used a version of his theory to draw up plans for the Nazi colonisation of areas the German army occupied in the east.[135]

The 1953 aerial image shows all that remains from the Palestinian locality of Beikat Abu Malik of the al-Hanajrah tribe near one of the tributaries of Wadi al-Sharia. The orchard survived the ungrounding, but the entire area surrounding it has been ploughed over by fields belonging to kibbutz Be’eri. Faint traces of its original structures could however still be seen through the freshly ploughed surface.

Zionist planners recognised two main types of agricultural settlements. The kibbutz was a cooperative settlement that was

the main vehicle of colonisation since the early twentieth century. It was based on communal living, shared infrastructure and means of production, with separate areas for housing, public functions, fields and farms. Kibbutz settlements were almost exclusively inhabited by members of the labour movement, mainly Eastern Europeans. Another type of agrarian settlement was the moshav. Roughly as old as the kibbutz type, it combined private property with joint ownership and cooperative employment of the means of agricultural production – the warehouses, pipelines and tractors were collectively owned. While early moshav settlements were established by nuclei of Eastern European settlers, most of the moshav settlements and 'development towns' established in the 1950s were meant to house Jewish immigrants from North Africa – the 'Arab Jews'. In them, the government hoped, the new migrants would be made productive as farmers and factory workers in the front's near rear. [136] Planners thought that the moshav was a better model for absorbing Jewish immigrants from Arab countries because it didn't require long ideological training and social preparation. [137] In the orientalist perspective of the nascent Israeli state, Jewish migrants from Arab countries were not trusted as defenders, and even seen as a threat to the dominance of modern European culture. The moshav settlements and the 'development towns' were meant to keep the Arab Jews away from the centre of the country. Receiving free leases over large expanses of Palestinian land, the agrarian settlements achieved economic independence, while the 'development towns' fell into poverty, with many of their residents reduced to finding employment as seasonal labourers in the very agrarian settlements to which they were meant to provide administrative services.

Out of the four graduates of the Bauhaus who migrated to Mandatory Palestine and worked for the Zionist movement, two were central to the design of the Gaza Envelope. The Israeli myth of the Bauhaus posited that Jewish architects who trained there and fled Nazi prosecution brought modern architecture to Mandatory Palestine, with Tel Aviv's 'White City' – the

neighbourhood built during the pre-state Mandatory period on the sand dunes outside Jaffa – being its prime manifestation. Rotbard has already shown that this narrative is not based in fact: the White City was not designed by Bauhaus architects and such neighbourhoods were rather common manifestations of colonial modernism across the southern Mediterranean, as in similar urban neighbourhoods for European settlers and local elites in cities such as Algiers, Tunis and Cairo.[138] Rimal, built at roughly the same time, and likewise on sand dunes, was somewhat the Gazan equivalent of the White City. If the Bauhaus has any important legacy in Palestine, it is arguably not in Tel Aviv but rather in the Gaza Envelope.

Regional Defence

Despite the widespread ethnic cleansing of the areas under Israel's control, the Israeli army perceived its geostrategic situation as precarious.[139] The army sought to establish systems of defence along the entire frontier zone. Settlements were seen as an essential part of the defence from two main threats: a military invasion of a conventional army – such as in a repeat of the 1948 war – and the return of Palestinians to areas from which they had been expelled.[140]

The military Settlement Division was established in 1947 as part of the Haganah, to engage with the security dimension of settlement design. It was the military corollary of the civilian and governmental Planning Department with which it had to coordinate all matters concerning settlements from early 1948 onwards. At the end of 1948, as battles were being waged, the Settlement Division released a document entitled 'Security Principles in the Planning of Agricultural Settlements and Workers' Villages'. By late 1950 it had evolved into a guideline for planners.

On the regional scale, it determined the distribution of settlements across the frontier zone, as well as the type of settlements suitable for each location. On the smaller scale, the

principles were concerned with all aspects of the settlements' internal layout. The Settlement Division's rush to establish settlements along the state's frontiers brought them into frequent conflict with the civilian planners of the Planning Department, whose master plan for the entire country was based on what they regarded as 'the scientific model' which balanced considerations from economy, transport, agriculture and water. In 1949 the army chief of staff, Yigal Yadin, demanded that the government declare a 'state of emergency' for two years to oblige the civil bodies to accept the primacy of military considerations.[141] When planners refused to establish a settlement point that the army deemed strategic owing to reasons such as lack of water, as was the case in the southern border with Egypt and around Gaza, military officers demanded that the government declare 'a state of water emergency' to compel the subordination of water trafficking to military–security design. Ben-Gurion did not acquiesce, and these proposals did not come to pass. He did not need to: in the early 1950s, the military had the upper hand in matters of planning. Civilian planners, many of whom were former officers, internalised the army's security principles. So great was the army's faith in the strategic value of civilian settlements that in 1951 it established the special corps Weitz had advocated for since 1947 – a military unit of settler-soldiers. The Nahal – a Hebrew acronym for Fighting Pioneering Youth (the word also means 'a water stream') – became the settlement arm of the army. Soldiers combined military service in infantry units with agricultural work in newly established frontier outposts usually placed in strategic locations along the frontier. A few years after their establishment the military-agrarian outposts of the Nahal were meant to turn into civilian villages, mostly of the kibbutz type. The first ever Nahal-type settlement was Nahal Oz, established right by the trench line, along the main road leading from Gaza City to Hebron on lands belonging to the small Bedouin Palestinian village of al-Wuheidi.[142] Between 1950 and 1958, no fewer than thirty-five Nahal outposts were established across Israel's new frontier.

As the settlements had to follow the new borders, the hierarchical layout of Sharon's master plan – in which smaller villages surrounded larger ones within a wide expanse of land – was stretched into a linear form. Rather than concentric circles, in which settlements surround towns, the settlements of the Sharon Plan around the Gaza Strip were arranged in several lines parallel to the front line. The first line of defence was largely made up of the kibbutz outposts/settlements. In his book *Curtain of Sand*, written in 1959 when he was a member of the Knesset, Yigal Allon captured the zeitgeist by declaring the architecture of the kibbutz to be superior to all other forms of Zionist settlements.[143] Moreover, he wrote following the spirit of his mentor Yosef Weitz, that the kibbutz 'is no less valuable than a military unit, and may even surpass it'. Placed along the frontier, these settlements 'will provide the state with forward observation posts, saving on military men. These settlements are capable not only of informing the military in advance about a surprise enemy attack, but of trying to halt it, or at least delaying the progress of the enemy until the military reinforcements arrive to control the situation.'[144]

Aharon Harsina joined the Settlement Division from its inception in 1947 and commanded it from 1950 for the following twenty years. In 1976, six years after his retirement, he recorded a long audio interview with the army history department.[145] In the interview, which was never published but whose transcript lies in the army's archive, he confirmed that building 'a line of defence' around the Gaza Strip was the Settlement Division's overall priority during the 1950s. 'At the beginning we established Class A settlements to close off the Strip, establish the border, set facts on the ground.' 'Class A' is the term military planners use to refer to kibbutz settlements. Harsina advocated for kibbutz Zikim to be located on the estuary of Wadi Hesy, at the northern limit of the Strip, 'to close off the coastline'. Zikim's strategic position on the coast meant many returnees had to pass by it on their way north. The kibbutz's members developed and employed traps, wires and 'jumping mines' – that came to be

known as the Zikim System – and placed them along the roads frequented by returnees, killing many. The kibbutz settlement of Yad Mordechai, named after the commander of the Warsaw Ghetto Uprising against the Nazis during the Second World War, was built upstream of Wadi Hesy on the ruins of the Palestinian village of Deir Sneid. The task of kibbutz Erez, according to Harsina, was to close off the Gaza–al-Majdal–Jaffa road, the continuation of the ancient coastal route. Near kibbutz Erez the army later located a military base by the same name which evolved into the main 'border terminal' through which anyone travelling from Gaza to the rest of Palestine must pass. Then, Harsina said, planners had to 'move backwards', meaning southwards, where they established a sequence of settlements parallel to the trench line all the way to the Egyptian border. One of these settlements was kibbutz Be'eri, which started in 1946 with a small nucleus that occupied a disused British sulphur mine. Kibbutz Re'im was placed on the old route connecting Gaza to Beersheba, close to the area where the two main tributaries of Wadi Gaza connect. On this strategic location, a crossroads of waterways and main roads that was inhabited by communities belonging to the al-Hanajrah tribe, the army would establish years later the headquarters of the Gaza Division. Near it planners would designate a site for the small recreational forest which the organisers of the Nova music festival chose as the location for their 6–7 October 2023 party. 'Closing off the northern part of the Strip was easier,' Harsina recalled; 'the distance to the centre was shorter and there was enough water.' In the north 'the soil is loess, which we know how to cultivate'. The further south the line of settlement extended, the more arid the landscape became and the soil became a mixture of loess and sand. For settlements to be established south of Wadi Gaza basin the challenge was supplying them with water by pipe. The 'Yarkon–Negev line', which originated in aquifer waters east of Jaffa, was constructed with recycled fire hoses imported from London, where they had been used during the Blitz.[146] It was the arrival of the pipeline that enabled the inhabitation of the kibbutz settlements of Ein

HaShlosha, Nirim and Nir Oz. By the end of 1949, the pipe extended as far south as the Egyptian border allowing for the establishment of kibbutz Nir Yitzhak, replacing the military base that occupied the old Nirim settlement in Dangour where the monstrous rape had occurred a few months earlier. When this settlement was put on the ground, Harsina concluded, 'we managed to close off this business of the Gaza Strip'.[147] Behind the front line of 'Class A' kibbutz settlements, the army's principles advocated 'defence in depth' which meant more settlements in the rear. A second line of moshav settlements which Harsina referred to as 'Class B' was established and behind them planners put a few 'development towns' as the Sharon Plan recommended. The development town of Sderot was built on the north-eastern corner of the Gaza Strip in front of Beit Hanoun, Netivot was located further back on the old Gaza–Beersheba road, and Ofakim was established along the old Khan Younis–Beersheba road. The three development towns were placed on lands belonging to members of the al-Tarabin and al-Hanajrah tribes.

Hedgehogs

The 'Security Principles' called for the distance between one settlement and the next to be the range of mortar fire, which at the time was three to five kilometres. Each settlement was meant to function as an 'island of resistance'. Settlers were expected to defend their settlement and others by generating 'a matrix of fire'. The document also advised on the internal layout of settlements, the location of shelters and security buildings, and the construction materials.[148] The document primarily referred to the new moshav settlements but took kibbutz settlements like that of Nirim as its archetype of defence. Settlements should have a compact core where public functions were to take place. The narrow side of each building should face the enemy and have only small openings. The walls of shelters and weapons storage rooms should be concrete and at least twenty centimetres thick. From the core, roads should fan out in all directions so that

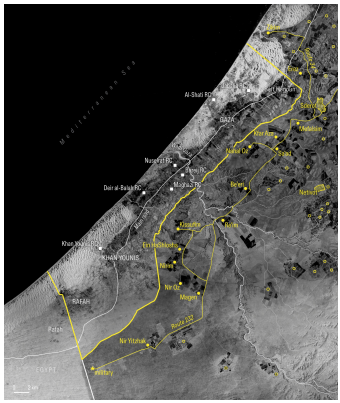
‘flanking fire could be maximised.’[149] It was the principle of pentagon defence without committing to its literal shape. The inner fence should be fifty metres away from the outermost buildings, with the barbed wire facing outwards. The outer fence should be no further than 120 metres from the last building. Lighting poles should be located along the inner fence every forty-five metres. The patrol road and guard dogs should occupy the space between the fences.[150]

Front-line settlements built by these principles were referred to as ‘hedgehogs’. Each settlement had a security officer who coordinated surveillance, guard duty, patrols, ambushes, and the mining of approach roads. Settlers were to be provided with small arms, two ‘medium machine guns’, two 81 mm mortar launchers and mines, and received military training in operating them.[151] The area between the settlements and the trench line should be cultivated with field crops which offered a relatively open plain of vision and fire.[152] The settlements should be as small as possible, like ‘fists’ in the landscape, surrounded by large open fields.

The kibbutz type can more easily achieve a compact layout with all communal functions and housing clustered together. The moshav settlements, on the other hand, required an agricultural plot near every home. Moshav settlers ‘wanted to go outside and turn the water on in their pyjamas’, Harsina complained. A large plot next to each home generated large gaps and elongated the settlement. ‘When infiltrators enter one side, on the other side they wouldn’t know about it,’ he said. Such layouts were still implemented until, Harsina recalled, ‘Dayan said one day that he “will himself take a bulldozer and destroy the houses at the extreme ends”.’[153] Decreasing the distance between houses ‘was also better for social cohesion’, Harsina added.

The pre-state agricultural economy was based on the ‘mixed farm’ model. Each settlement cultivated a mixture of different kinds of crops allowing it to be self-sufficient. After 1948, planners advocated for what they called ‘field farms’ – each settlement specialised in a particular monocrop and cultivated it

in large fields. This betrayed another prejudice that the hegemonic Ashkenazi elite had against the Arab Jews. Whereas the ‘mixed farm’ required specialist knowledge of the different cultivation cycles of many species, a level of skill they thought could be managed by the European settlers, ‘the structure of the field farm is suitable to the new immigrant in its simplicity’.[154]



Palestinians were expelled from the fertile soils in the east and settled in refugee camps (white squares) on the coastal dunes. The main Rafah–Gaza road, the ancient Via Maris, runs along the edge of the dune. The armistice line (yellow) is mostly a three-kilometre offset from the road, thus reflecting the shape of the dunes. The front line of kibbutz settlements (yellow points) is roughly three kilometres back from the armistice line. The area in between the settlements and the armistice line was a buffer zone. The matrix of moshav settlements (yellow circles) and development towns (yellow pattern) was placed behind/east of the frontline kibbutz settlements.

The matrix of settlements required a road network, which the army preferred over axial railroad systems. The network could reach all isolated small farms and enable the fast transfer of military forces from one front to another. If one point fell, the gap could be closed by others. Gradually with the evolution of armoured forces across the region, military planners understood that settlements would not be able to hold back military attacks. ‘Though not a liability, the settlements were not much help,’ Yitzhak Rabin, then a military officer, dryly commented in 1951;

‘against Arab armies the answer is the IDF’.[155]

The real security function of the settlement was not to stop the Egyptian army but to transform the landscape beyond recognition and intercept the Palestinian refugees on whose lands they stood. By 1952 the Israeli military had recorded 5,000 acts of ‘infiltration’.[156] In the first two years after the Nakba, Israeli settlers and soldiers recorded the killing of more than 2,000 Palestinian returnees. At least 5,000 were killed between 1948 and 1956 across the entire frontiers of the nascent state, the vast majority unarmed; many more must have gone unrecorded.[157]

Between 1949 and 1951, the height of Israel’s construction frenzy, more than 200 settlements were established across the frontiers of Palestine, 134 of them along the armistice lines with Syria, Lebanon, Jordan and Egypt. The rate of construction gradually slowed down, but a decade after the Nakba there were over 400 new rural settlements and thirty new towns across the emptied lands all along the state’s frontiers. The densest distribution of settlements was along the lines surrounding the Gaza Strip.[158]

The Fedayeen War

In the early 1950s the armed resistance groups that formed in the refugee camps throughout the Strip evolved into a guerilla force known as Fedayeen, literally the ‘self-sacrificers’. Salman’s cousin Abdullah Abu Sitta, who commanded the Palestinian resistance in the Beersheba district from the Great Arab revolt of 1936–9 through to the Nakba of 1947–9 was central to their organisation.[159] He started assembling recruits amongst the young men who were motivated to join the fight. ‘One night,’ Salman writes, ‘unable to sleep, I got up and wandered around the house in the darkness where I saw half a dozen figures with Abdullah. They had moved the parked jeep a few paces from the garage and removed a false door with a pit dug underneath. They carried rifles and machine guns one by one, loaded them into the jeep, and disappeared into the night.’ The underground weapons cache

was meant to hide the arms from the Egyptian army. King Farouk had ordered the arrest of the Palestinian fighters to prevent escalation.[160] The July 1952 toppling of the king and the rise of the Free Officers, initially led by Mohamed Naguib and Gamal Abdel Nasser, started a process that would lead to Egypt's support of Palestinian armed resistance. While sporadic acts of armed return had started already in 1948, they were limited incursions, mostly by individuals and small groups, but in the 1950s the raids gradually evolved into organised ambushes and the laying of mines. In December 1952 the new Egyptian government assembled a Palestinian paramilitary police force which, together with the Egyptian army, started to train and supply Palestinian fighting groups, who organised attacks against the Israeli army and settlers. Nasser became president in 1954. Between 1954 and 1956 Fedayeen attacks evolved into what Palestinians call Harb al-Fedayeen, 'the Fedayeen War'.[161]

In the summer of 1953 the army established Unit 101 under the command of Ariel Sharon. Its aim was to conduct cross-border raids on refugee camps and Egyptian forces. The army referred to such raids as 'retribution operations'. Sharon, who was still in his twenties, had close access to Prime Minister David Ben-Gurion and Moshe Dayan, who had taken over as commander of the army at the end of 1953. They knew these raids would raise international condemnation. The orders were always given orally in an attempt to bypass government and military hierarchy and leave Ben-Gurion and Dayan the option of denying responsibility. The unit – whose members were recruited only from kibbutz and moshav settlements – began a rampage of attacks that departed from the first line of kibbutz settlements around Gaza. The unit was disbanded at the start of 1954, less than six months after being formed, but its soldiers were absorbed into the Paratroopers Brigade which went on to carry out similar raids.

From 1950 Levi Eshkol (who would become prime minister in the 1960s) and Yosef Weitz developed plans to expel Palestinian refugees from Gaza, where they were within eyeshot of their lands and continuously attempted to return. Amongst the

destinations they imagined could absorb them were the recently abandoned Italian colonial villages in northern Libya, and later a set of agricultural communities in northern Sinai.[162] Amongst the aims of the raids into the Gaza Strip was the instigation of a crisis meant to force the United Nations and Egypt to do what the Israeli army had failed to do at the end of 1948 and relocate the Palestinian refugees from Gaza. In 1953, the raids succeeded in leading the Egyptian government and UNRWA to put forward a plan to relocate 12,000 refugee families from the Gaza Strip to plots of land in the north-western Sinai Desert. The otherwise arid landscape would be irrigated by redirecting a freshwater canal from the Nile. The refugees would grow barley and citrus for export to Europe and the Persian Gulf. The plan had the support of the US administration, which agreed to contribute $30 million. Palestinian refugees refused and resisted any resettlement plan that did not involve their return to their lands, and started mobilising against it. On the night of 28 August 1953, an Israeli military unit launched an attack on al-Bureij camp, killing fifty Palestinians. The attack was understood to be part of the push to dismantle the camps and relocate refugees. The wave of protests against the plan began at al-Bureij camp and continued for more than a year.[163] On 28 February 1955, an Israeli raid killed thirty-eight Egyptian soldiers near Gaza City. In March the popular protest gathered force and ignited an uprising, under the joint leadership of Palestinian communists and the Muslim Brotherhood. 'They wrote the Sinai plan in ink, and we shall erase it with blood!'[164] It was the largest Palestinian mass mobilisation since 1948. Protesters targeted UN offices and supply stores, some went up in flames.[165] The 'March Intifada' forced the cancellation of the refugee resettlement projects, a significant early victory for organised Palestinian politics after the Nakba. Protesters further demanded that Egypt support the formation of Palestinian military units to defend against Israeli military aggression. Nasser acquiesced and increased support for Palestinian Fedayeen, and built up troops in the Gaza Strip. In August 1955 Sharon's paratroopers raided Khan Younis. They

blew up the police station and killed seventy-two Palestinians.[166] The raids left from the military outposts near the White House of Abu Ibreisha. When his troops retreated, Sharon demanded that kibbutz Nirim hide his troops from the UN observers in the settlement's tractor sheds. Israel denied its troops had even crossed into Gaza.[167]

Starting in 1955, at roughly the same time as Israeli forces were conducting raids in Gaza and Khan Younis, French paratroopers under the notorious Jacques Massu, a colonial officer already known for the atrocities committed under his command in French-colonised Vietnam the previous decade, conducted raids on the old city of Algiers. The French army expelled 2 million rural Algerians from their land – declared entire territories as *zones interdites* or forbidden zones – and drove them into fenced camps known as *centres de regroupement*, which roughly translates as 'regrouping centres', because France wanted to avoid the term 'concentration camps', though this is what they were.[168] Decades later, Jean-Marie Le Pen, the notorious founder of the far-right National Front, who was one of Jacques Massu's soldiers, favourably compared France's colonial war in Algeria to Sharon's raids against Palestinian refugee camps.

Manifest Destiny

At the end of April 1956 a group of Fedayeen assembled in the citrus orchards of Shuja'iyya, on the eastern outskirts of Gaza City, close to the trench line. On the other side of the line was kibbutz Nahal Oz, established by the army five years earlier and since turned into a civilian settlement. The target of the attack was Ro'i Rothberg, the kibbutz security officer. Rothberg frequently patrolled the trench line and had previously shot Palestinian returnees who crossed it. Palestinians claimed he had also stolen several mules. A group of five assailants, including a Palestinian farmer and a police sergeant, knew Rothberg would come riding in if he saw Palestinians harvesting across the line. The farmers were used as bait. As Rothberg approached, they

retreated into the orchards on the Gaza side of the trench line. The unit sprang from concealment and shot Rothberg off his horse. They took his body back through the orchards. The UN intervened and the body was returned the same day.[169] On the day Rothberg was shot, Moshe Dayan, who was now the army chief of staff, happened to be in the settlement for a wedding, which in keeping with the collectivist tradition of the kibbutz was planned as a single ceremony for three couples. The wedding was postponed to make space for Rothberg's funeral. Dayan asked to give the eulogy. The text entered Zionist mythology, though its most famous lines were not read out at the funeral, but printed a few days later in the Israeli workers' daily *Davar*. Dayan spoke of the men who killed Rothberg and asked that his audience 'not cast the blame on the murderers today. Why should we complain of their hatred for us? Eight years they sat in the refugee camps of Gaza, and saw in front of their eyes how we turned the lands and the villages in which they and their forefathers once dwelled into our inheritance.' It was a rare admission of what Palestinians had lost that no present-day Israeli politicians can afford to express.

The late Lebanese writer Elias Khoury wrote that the speech offered a 'fleeting moment of recognition of the settler colonial apparatus'.[170] Dayan understood the injustice and horror he had created only too well – he had presided over the ethnic cleansing of many Palestinian localities in 1948 – but he wasn't advocating for what was taken to be returned or for Israel's accepting UN Resolution 194, first affirmed in 1948, and stipulating that 'refugees wishing to return to their homes…should be permitted to do so at the earliest practicable date'. Dayan's argument with Palestinian refugees was not about their rights. Rather he was arguing that Israelis had to prepare for a permanent war to deny their ability to exercise it. He ended his eulogy saying, 'This is our life's choice – to be prepared and armed, strong and determined lest the sword be stricken from our fist and our lives cut down.' In this endless colonial war a major role would be given to frontier settlements such as Nahal Oz which carried on their shoulders – just like the biblical Samson – 'the gates of Gaza'. Nahal Oz

formed a link in the chain of settlements that Ben-Gurion called the 'living wall'. This was Labour Zionism's answer to the 1923 call by Vladimir Jabotinsky, the father of nationalist 'revisionist' Zionism, for an 'Iron Wall', which he understood as the military force – then British – necessary to secure Zionist colonisation. Like Dayan and Ben-Gurion of the Labour Movement, Jabotinsky understood that there was no instance anywhere of 'colonisation being carried on with the consent of the native population'. Like Dayan he was empathetic to Palestinian resistance: 'They feel at least the same instinctive jealous love of Palestine, as the old Aztecs felt for ancient Mexico, and the Sioux for their rolling Prairies.'[171] The fulfilment of Dayan's eulogy about stopping Palestinians from returning to their land described the logic of elimination latent within Israel's settler colonial project around Gaza and elsewhere. This, according to Khoury, captures Israel's manifest destiny: 'Jews are divinely ordained to settle Palestine. Palestinians should either give up or die.'[172]

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In October 1956, Israel joined France and Britain in a joint attack over Egypt. The old imperial powers sought to occupy the Suez Canal which Nasser had nationalised a few months earlier. Israel sought to occupy and hold the Sinai Desert. After occupying Sinai and the Gaza Strip, the army and Shin Bet rounded up and publicly executed several hundred Palestinians in Khan Younis, Rafah and on the dunes of al-Mawasi near the beach.[173] Ben-Gurion hoped that the assassination of political and community leaders would allow Israel to break Palestinian society, expel Palestinians to Sinai, annex and settle the Strip with more agrarian settlements. However, US president Dwight Eisenhower forced France, Britain and Israel to withdraw from the areas they occupied, for fear of Soviet intervention. Before its withdrawal from Sinai and Gaza, in March 1957, the Israeli army undertook a detailed cartographic survey of these territories in preparation for the next round of war, which would indeed take place a little over

ten years later.

The Green Revolution

While the early 1950s saw plentiful rainfall, the last years of that decade saw a cycle of drought which slowed the agricultural push southwards. The water from the Yaron–Negev line was not enough to irrigate the drying fields. Settlers did not know how to mitigate droughts in the same way the area's Indigenous inhabitants did, now refugees in Gaza. Some settlers moved back to the big cities. The drought gave a little breathing space to the Palestinian Bedouin families left in Israeli territory, who started attempting to return to their lands in the Wadi Gaza basin.

The water crisis was seen as a national emergency, and led the government to seek changes to existing agrarian practices. This included the introduction of new plant varieties, the rearrangement of water circulation, as well as improvement of soil composition. The Gaza Envelope is the area where the concept of a Jewish return to a 'dead area to be revived' and in which the desert is made to bloom has been most clearly manifested. The introduction of dams along the tributaries of Wadi Gaza, deep well drilling, artificial irrigation, deep ploughing techniques, new seed types, mechanised modes of cultivation and the application of fertilisers and pesticides were seen as necessary to expand settlement, maintain cultivation and improve yield in the strategic, and vulnerable to draughts, environments of the Gaza Envelope. The state sought to put its efforts in forcing the desert into a gradual retreat.

Agriculture in pre-Nakba Palestine traditionally relied on natural irrigation and crop rotation in mixed farms. Fertilisation was largely undertaken by organic sources: animal and human manure and compost. After the Nakba, the grabbed soil was transformed through its mixing with mineral and chemical fertilisers. They may have increased agricultural yield in the short term but also led to long-term degradation and downstream pollution. Throughout the later part of the 1950s and the 1960s

the Israeli government spent roughly the same amount on agriculture and water infrastructure as it did on the army. The large orthogonal fields of intensive field-farming best suited the integrated system of mechanised cultivation, harvesting, centralised storage, sorting, packing, transport and distribution.[174] The government provided farmers with state-backed grants, credit and drought insurance. Large monocultural cultivation and harvest happens all at once during short periods, and drought and disease could ruin a year's labour without the option of offsetting losses from one crop with the surpluses of another.[175]

In the early 1960s the state started to construct the National Water Carrier, a 130-kilometre system moving water from the Sea of Galilee to the Gaza Envelope and the northern Negev.[176] Another key resource for increasing yield was the mineral geology of the Dead Sea which included large deposits of magnesium, potassium, phosphorus and bromine. Extraction of Dead Sea minerals had begun in 1929 by the British Mandate's Palestine Potash Company, but was expanded after its nationalisation by Israel as Dead Sea Works.[177] When spread on fields, potash, the mineral product that contains potassium, improves a plant's water retention. This is more consequential in dry environments as it helps the plant use limited water more efficiently.[178] When spread on fields, phosphorus, a mineral mined in the Dead Sea as phosphate, helps plants improve photosynthesis, and root and seed development. Bromine, another mineral mined in the Dead Sea, acts as a pesticide useful for destroying crop-eating rats and insects. The push into the drier parts relied on the reshuffling of Palestine's soils and minerals from one place to another.

Artificial fertilisers also play a large role in increasing yield. Nitrogen gas makes up most of the atmosphere. Mix it with hydrogen and one gets ammonium nitrate, a key material in explosives that is also one of the world's most powerful fertilisers. When dripped onto agricultural soil, ammonium nitrate stimulates and accelerates plant growth. It was this invention, associated with the turn-of-the-twentieth-century work of Jewish-German chemist Fritz Haber, that most significantly contributed

to the increase in agricultural productivity which in turn helped grow the global population, and inaugurated what came to be known as the 'Green Revolution'. After the Second World War, nitrogen factories shifted from the production of explosives to fertilisers. The opposite move from fertilisers to explosives can also be made, as demonstrated by the IRA in the 1990s, in the 1995 bombing of the Federal Building in Oklahoma City, and in the 2020 Beirut Port explosion.

The application of fertilisers required machines which favoured large monocrop fields. In the 1960s, fertilisers would be added to watering systems of 'drip irrigation' that discharge water directly to the roots of plants to minimise evaporation. In later decades, sensors started allowing the prescribing of specific amounts of water for certain areas (higher ground, for example) within the field. Israel's systems of industrial agriculture were exported to newly independent African states – Ghana, Kenya, Senegal, Congo and Uganda – that aligned with Western powers.[179] During the first decade of the state, some 30 per cent of all cereal cultivation in Israel came from the settlements of the Gaza Envelope and the northern Negev. Gradually the region became home to other cash crops like strawberries, tomatoes, melons, herbs and cabbages.

From Palestine's breadbasket, the area of Wadi Gaza turned into Israel's main agricultural zone. Prior to October 2023, the nutritional output of the edible crops cultivated in the Gaza Envelope accounted for over half of the annual energy requirements of the Israeli population, and exceeded its annual requirement of fibre, vitamins and minerals. It produced a quarter of Israel's field crops, citrus, and vegetables; over a half of leeks, Jerusalem artichokes, cherry tomatoes, ginger, spinach, nigella, carrots, peanuts, barley and prickly pear cacti; three-quarters of all sweet potatoes; and all of Israel's radishes.[180]

In the decade before 7 October 2023, the Envelope had an average per capita GDP of $55,000 compared to the Strip's $1,250.[181] Despite heavy subsidies and tax breaks on one side and designed destruction on the other, the population of the Gaza

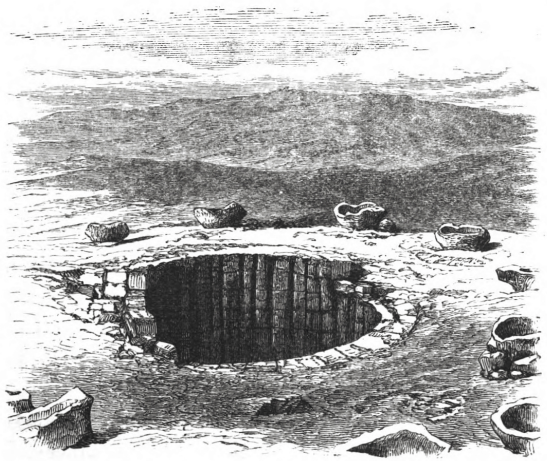
Strip grew to 2.3 million Palestinians while, as mentioned earlier, the population of the Envelope's fifty-eight settlements remained relatively static at 70,000 inhabitants, with a large proportion of retirees. Over time the pioneering spirit of the original settlers waned. After 1967, manual agricultural labour was no longer performed by Jewish settlers but mainly by Palestinian workers from Gaza and those that remained in the Negev, some of whom tended the land from which their families had been expelled. When restrictions on the exit of Palestinians from the Gaza Strip were tightened, a large part of the agricultural labour force in the Gaza Envelope began to be provided by migrants from low-income non-Muslim countries such as Thailand on short-term visas. Israel and Thailand had made military and agricultural exchanges since the Vietnam War in the 1970s, when Thailand sought Israeli advice in fortifying its frontiers with Laos and Cambodia, and Israel exported to Thailand its Nahal model of militarised settlement.[182] Workers from the Philippines provided geriatric care.

Wadi Gaza flows from the Envelope to the Strip. Israeli settlements control, dam and use most flood waters with a system of dams and reservoirs. Israel 'exports' down the wadi the toxic nitrate fertilisers, pesticides and waste from animal agriculture. Until the 1970s there was no fence around Gaza and the refuse was flowing over the surface. Thereafter the toxic water was channelled through concrete tubes under an ever-thickening system of walls and fences. The wadi emerged on the other side of the fences a different stream altogether.[183] Along the nine kilometres it meanders to the sea, toxic refuse was mixed with wastewater. The banks were lined with domestic waste and animal carcasses. A decade ago, researchers from al-Azhar University in Gaza warned that the siege would lead to 'Gaza's Valley of Slow Death'.[184] Beginning in 2012, Gaza municipality undertook a process of cleaning that restored some stretches of the wadi and created one of the only recreation parks in Gaza. In the early autumn of 2023, migrating birds returned to nest in the wadi's side growth. The restoration was almost complete when

the carnage began.[185]

Part II

Subsoil



A nineteenth-century line engraving of a well near Beersheba within the Wadi Gaza basin.

Wells

Yahya Sinwar, Hamas leader between 2017 and his killing in 2024, begins his fictional autobiography *The Thorn and the Carnation*, written while in an Israeli prison, with his protagonist's earliest memory. Shortly after Israeli forces broke into Gaza in 1967, his father started digging a hole in their courtyard in the refugee camp of al-Shati (Sinwar grew up in the Khan Younis refugee camp): 'my father borrowed a pickaxe (*turiyah*) from the neighbours and began digging a large, long hole in the yard in front of our house, with some help from my brother Mahmoud, who was twelve at the time. After they finished preparing the hole, my father started placing pieces of wood on it and then began covering it with zinc sheets that used to cover part of the courtyard like an arbour.' Many Palestinians in Gaza were similarly digging shelters and retreating into the subsoil. 'My mother brought bedding from the house, as well as some water and food, and took all of us down into the hole and sang to us.'[1] They hid for days, hoping to hear on the radio about the defeat of Israeli forces and their imminent return to their lands (Sinwar's family was displaced from al-Majdal north of Gaza). After a few days the Egyptian radio station could no longer hide the news of the defeat of the Arab armies.

Over the decades since, the subsoil has become the only part of Palestine still unoccupied, a sanctuary through which Palestinians excavated cross-border supply routes and constructed fortifications and channels of movement in the armed struggle against the occupation.[2] For Israelis the subsoil is a place of nightmares, monsters, the dead and undead. The dehumanisation of Palestinians as 'human animals', an infestation out of control, alludes to the subsoil as the place from where the 'children of darkness' rise to fight the 'children of light', in the words spoken by Prime Minister Benjamin Netanyahu after 7 October 2023.

From both an architectural and a historical perspective,

tunnels begin with wells. Architecturally, well-like shafts are a vertical link into the systems occupying the subsoil. From these shafts, tunnel diggers proceed horizontally in different directions. From a historical perspective it was the techniques of digging, reinforcing and maintaining deep wells, developed by the different cultures that inhabited the area, that evolved into the knowledge necessary for the excavation and reinforcement of tunnels.

All along the tributaries of Wadi Gaza, there is a chain of historical and contemporary wells, many of which are still active despite the expulsion of their owners. The wells of the Beersheba district and the south-western coast are amongst the deepest in Palestine, something that required much skill in construction. In his 1943 *Ghazza ʻAbr al-Tarikh* (*Gaza Through History*), Aref al-Aref recorded the depth of municipal wells in the Gaza area and concluded that around the town of Gaza the underground water level is between thirty and forty metres below the surface.[3] His contemporary Hilmi Abu Shaʻban, who unlike al-Aref was from Gaza, not only focused on regulated municipal wells, but was familiar with the domestic and agricultural wells that al-Aref had left out of his account. The depth of wells according to Abu Shaʻban had large variations depending on the distance from the shoreline. The depth of wells corresponds to the depth of the underground water reservoirs known as the coastal aquifers. The groundwater level is higher near the shoreline where, as Abu Shaʻban noted, ʻany small child could dig a well in the sand on the beach and drink sweet water from it'. It gets deeper the further one goes from the coast.[4] The shallow coastal wells are associated with the families who inhabit the coastal dunes between Khan Younis and Rafah. The *mawasi* system, which gave the dunes and their inhabitants their name, means ʻsyphoning' in Arabic, referring to small depressions dug between the dunes to extract shallow groundwater. From October 2023 this system of water extraction has been revived to ensure the survival of hundreds of thousands of Palestinians expelled from across Gaza towards these dunes, and without which they would not

otherwise have enough water to live. A few kilometres east from the shoreline, one has to dig twenty to forty metres to reach fresh water. Gaza's oldest well, in the al-Tuffah neighbourhood in Gaza City, is the al-Ajmaqiya well, twenty-three metres deep: 'no one knows exactly who dug it or when', writes the Jaffa-born educator and historian Mustafa Murad al-Dabbagh in his encyclopedic *Palestine, Our Homeland*, in which, during the 1960s, he recorded the depth of forty-eight wells in and around Gaza City.[5] Further east one must dig even deeper to reach water. The well in Bani Suheila, a village east of Khan Younis is sixty-eight metres deep, al-Dabbagh noted. The residents of the village of Beit Hanoun, north-east of Gaza City, drink from a well reaching ninety metres deep.[6] The well in al-Ma'in, on the third and highest sandstone ridge overlooking Khan Younis, as reported both by Salman Abu Sitta and confirmed by its occupiers, was ninety-five metres deep. If one was to drop a coin into a well that deep – plenty of Byzantine coins have been found near the site – it would take four seconds before the sound of the splash is heard at the surface. All along the tributaries of Wadi Gaza, the wells need to go even deeper. Long and needle-thin, what are sometimes referred to as 'Bedouin Wells' are an engineering feat no less impressive than building a hundred-metre tall tower. The subterranean space between the relatively flat ground surface and the sloping level of ground water is the volume within which tunnellers can operate.

Wells are probes into the organisation of soil. The first layer a digger traverses might be loess, clay or sand. More recently in Gaza, often one first encounters a top layer of building rubble, the result of constant bombardment. Loess and clay are viscous and malleable, ideal for maintaining shape. Sand only starts hardening a few metres below the surface as it becomes more compact, moist and pliable. The further down one digs, the more the well's round shaft sharpens into shape. Gaps left between the stones used to line the wells allow water to leak in through the soil, alleviating the build-up of pressure from the surrounding earth. Construction requires skill, because the reinforcement could

break, the land could sag and bury the digger under tens of metres of soil. ‘In our profession,’ a digger named Wael Zu‘rub from Khan Younis reported to the Arab media Ultra Palestine in 2019, ‘the first mistake is the last, unless God wills it. As soon as any mistake occurs, the sand may swallow us up, and the stones of the well may collapse on us, burying us at its bottom.’ He comes from a family of well-diggers, and his cousin was ‘swallowed up by sand dunes’ in the coastal area of al-Mawasi, his body never retrieved.[7] A few metres further down and the sand mixes with limestone dust into dry and brittle sandstone. The pace of mining slows. Sandstone has its advantages because it provides stability. Under the sandstone the digger reaches a few metres of malleable clay. For those who dig tunnels rather than wells, clay is the best medium to proceed horizontally within. Clay is relatively easy to shape and when it dries the cavities become self-supportive to a certain extent. Tunnels in this layer are like clay vessels.[8] The same sequence of sand, sandstone and clay repeats three times. Under Gaza City the layers of clay are at roughly twenty, forty and sixty metres. These levels became the three ‘storeys’ through which many of the tunnels extended horizontally prior to October 2023. The clay layers are important for well diggers too. They are almost impenetrable to water, and water accumulates in the sand or sandstone layers above them. The sandstone holds the water within small air cavities and acts like a sponge. When a well digger reaches the wet sandstone layers, the rock must be struck for the water to gush out. The act can feel Moses-like.

The soil layers constantly shift as water moves through them. This can cause the well shaft to collapse. The extracted clay is used to line and seal parts of the inner face of the well. Some of the extracted sandstone can be cut into blocks used to reinforce the shaft.[9] In the past hundred years or so, the lining of wells was made of precast concrete sections; so in the past four decades was that of tunnels. Once completed and reinforced, the well is often named after the person who dug it.

Tunnel shafts do not reach all the way to the water level. After

traversing a certain distance vertically, the tunnel digger continues horizontally to connect, in the deep recesses of the soil, to the bottom of another shaft. Horizontal connections between wells also have a long tradition, extending back to the area's Nabataean inhabitants who dug tunnels through the clay layers to create gently sloping channels known as *qanat*. These transferred water horizontally between vertical wells and in this way moved water to more arid parts.[10]

The soil layers are not neatly horizontal but slope towards the east. Experienced diggers know how to differentiate between types of soil by their texture, viscosity, moisture and density. It is in this way that the architecture of the tunnel system is determined by, and responds to, the geomorphology of the subsoil.[11]

The Four Year War

Immediately after the 1967 war that Israel celebrated as the Six Day War, Palestinian fighters collected the weapons left by the Egyptian army and started organising for a long war that would be named, in defiance of Israel's euphoria, the Four Year War. Palestinian writer and political activist Ghassan Kanafani wrote, 'you think that the story has ended, and then it begins again'.[12] In 1968 the planting of landmines and grenade attacks proliferated. Military bases, and infrastructure erected by the occupiers, such as electricity poles, outdoor lighting, water pipes, and petrol stations were bombed. Israeli shoppers in Gaza's markets were targeted, and Palestinians who collaborated with the occupation were killed. Most attacks were performed by the Palestinian National Liberation Movement or Fatah, the largest and dominant organisation within the Palestine Liberation Organisation (PLO) and the Popular Front for the Liberation of Palestine (PFLP).[13] Al-Shati camp was one of the main hubs of resistance, perched on a high sandstone cliff overlooking a narrow coastline. Between the camp and the cliff edge passed a section of the al-Rashid Road. This modern road ran all along the coastline

of the Gaza Strip. The confluence of geology and urban structure was conducive to guerilla war. The section of the road passing between al-Shati and the cliff was a good location for ambushes. Palestinian guerillas planted mines or sniped at military vehicles there and retreated into the depth of the camp. One of the commanders of the resistance in the camp was a refugee named Muhammad al-Aswad. Born in Haifa in 1946 and expelled with his family to Gaza as a two-year-old, al-Aswad is credited with developing the use of underground tunnels in Palestinian guerilla warfare. Years later, when his widow Widad Musleh al-Aswad, herself a Haifa-born refugee (she passed away on 14 February 2023) was interviewed about her husband's life, she speculated that it was his architectural education that contributed to his spatial inventions including the development of short, well-placed, tactical tunnels. In the 1960s al-Aswad, like many other Palestinian refugees, left Gaza to study in Cairo. He enrolled in architecture but did not complete his degree. Living in Cairo was too expensive. Al-Aswad returned to al-Shati in the mid 1960s having absorbed some of the anti-imperialist spirit that engulfed the Egyptian capital at that time. When he returned he became active in the Arab Nationalist Movement (ANM), a pan-Arabist armed group formed by physician turned military leader George Habash. In 1968 al-Aswad was captured by the army and imprisoned. Prisons were sites of intellectual education and political organising. In prison he adopted 'Guevara' as his *nom de guerre*, as did many left-wing guerilla fighters across the world (in 1959 when al-Aswad was thirteen years old, Che Guevara had spent a day in the Gaza Strip, including a visit to al-Bureij camp, on Nasser's invitation).[14] He then joined the left-wing PFLP, assembled by Habash from cadres of the ANM.[15]

Dig Tunnels Deep

In 1970, shortly after his release, the PFLP sent al-Aswad and a few other fighters to Beijing for training in guerilla warfare. In 1966 China had been the first international power to recognise

the PLO and cultivated ties with different Palestinian factions including Fatah, the PFLP and the Democratic Front for the Liberation of Palestine (DFLP).[16] Some Palestinians who travelled to China for training complained about the amount of time spent on Chinese revolutionary theory, ideological indoctrination, visits to factories, and meetings with Communist Party officials, though they appreciated studying tactics of liberation movements in Algeria, Mozambique and Cuba. A special focus was on Vietnam, which was in the midst of its Chinese-supported struggle against the US-backed military regime and the US military. The tunnels dug during the Vietnam War were at the time potent symbols of anti-imperialist struggle.[17]

However, in 1969 China had other types of tunnels in mind. It started constructing large networks of concrete reinforced underground tunnels under its main cities in anticipation of a possible nuclear war with the Soviet Union, after Sino-Soviet relations broke down. Mao Tse-tung liked to quote the sixth-century BC strategist Sun Tzu: 'the general who is skilled in defence, in effect, hides in the most secret recesses of the earth'. His own variation of the slogan 'dig tunnels deep' – by which he meant prepare for war – dates to this period of the late 1960s.[18]

Tunnel warfare did not begin in Vietnam. It had been a feature of many Indigenous struggles against colonialism around the world. It embodied the direct connection Indigenous peoples had with the soil at the time the surface was colonised. The Mapuche people of America's southern cone used deep trenches covered and camouflaged with branches to lay traps and move undetectably around the battlefield in their 400-year anti-colonial war in areas that are today southern Chile and Argentina. Starting in 1954, the Algerian National Liberation Front constructed and repurposed cellars and tunnels in the casbah of Algiers for hideouts and bomb workshops, and opened secret passages across party walls, moving undetected between homes across long distances within the old city or casbah whose streets were patrolled by the French paratroopers. In the 1940s the French troops, some of whom were later sent to Algiers, were fighting in

Vietnam against the anti-colonial insurgency of the communist-led national liberation movement the Viet Minh. These tunnels were expanded twenty years later by its successor, the National Liberation Front, or Viet Cong, into a network of 200 kilometres in their fight against the US-propped military dictatorship. The Viet Cong's tunnel network included shelters, operational bases, weapons storage, supply routes and civilian living quarters, a hospital, military bases, arms storage and production spaces, ammunition caches and military headquarters. Many of these tunnels were dug within the soft clay banks of the Saigon river in the rural districts of Cu Chi and the 'Iron Triangle' on the outskirts of the South Vietnamese capital, now called Ho Chi Minh City. Digging was undertaken in the monsoon season when the clay was moist and pliable. Soil scientists have recently argued that the local clay was crucial to their success. When dry, the cavities hardened into a concrete-like structure that withstood over two years of US bombing without structural support.[19]

Overground Tunnels

From China, al-Aswad travelled to Lebanon and from there back to Palestine. Upon his return in 1970, at twenty-three years old, he was appointed a member of the PFLP politburo and later its military commander in charge of its operations throughout Gaza. His unit carried out a number of hit-and-run attacks against Israeli soldiers near al-Shati, and he recruited members and set up bases in other refugee camps.[20]

The architecture of the tunnels was related to the architecture of the refugee camp. By the 1970s, the grid along which the UNRWA laid out the camps expanded to form a narrow maze of irregular alleyways. Gaps between the houses were filled in with additional structures, and extra floors were added. Corrugated tin or asbestos roofs were held in place by loose concrete blocks and car tyres. The larger structures of blue-painted UNRWA schools and clinics floated like ships within the sea of tin and concrete. Along the alleyways, murals depicted the towns and villages

refugees came from. Keys, symbolising the ambition to return, were painted everywhere. Slogans and portraits of leaders and martyrs from various competing organisations reinforced the community's faith in armed resistance. Sewage flowed in open gutters. The provisional, temporary nature of the camp was an act of defiance, guaranteeing that the place could not be mistaken for a permanent dwelling, a city. Camps were the material testimony of what was destroyed and all that remains of more than 500 cities, towns and villages forcefully cleansed throughout Palestine in the Nakba of 1947–9. For some, physical improvement was seen as a potential threat to the provisional nature of the camp, the normalisation of exile potentially compromising the right of return. Any improvement and development in the camp had to be negotiated with the political groups within it. In some camps refugees uprooted trees planted for recreation.

Others held the opposite view and encouraged the improvement of living conditions. Years later, when I was working with my colleagues Sandi Hilal and Alessandro Petti in our Bethlehem Studio, Decolonizing Architecture Art Residency (DAAR), with refugees from the Dheisheh camp, Abu Khalil, one of the leaders of the popular committee in the camp, made this perspective clearest: 'the stronger we are, the more we can fight for the right of return. If we need to fight for our daily bread, we cannot even begin to think about the return.' Refugees build in the camps 'in order for camps to provide political spaces', he told us at the time.[21]

The dense architecture of the refugee camp also supported the defenders. The alleyways were too narrow for military vehicles to drive through, and dismounted soldiers were unfamiliar with the alleys and at a disadvantage. The occupation forces rarely ventured in. Soon the camps became extraterritorial to Israeli power.

Widad al-Aswad told how in their small home in al-Shati refugee camp – 'two rooms, a bathroom and a ceiling so low it was almost hard to stand straight' – Muhammad constructed 'two layers of walls with enough space in between to hide and move

around'. From the space between the walls he dug a tunnel leading outside the house. Other tunnels connected separate homes within the camp. On one occasion, Widad recounted, the army raided the house and remained in it while Muhammad hid between the walls. During another raid, he was in another house and managed to escape via a tunnel. Al-Aswad's team, like the defenders of the Algerian casbah, also opened holes in party walls between homes, so that they could move across the camp from one building to the next without setting foot in the streets. Before helicopters and drones, rooftops were a common form of 'overground tunnels'. Cactus fences were common within and around the camps. Secret gaps made good escape routes, similar to the gap in the cactus fence that allowed Salman Abu Sitta's cousins to escape the Haganah in al-Ma'in in May 1948 – tunnels were not another medium of movement but continuous with the architecture of the camp. Thus with a few well-placed architectural interventions the Palestinian defenders managed to short-circuit the logic of circulation legible to the Israeli army. Widad said that al-Aswad made drawings of his architectural contraption to share with comrades in other camps.[22] In his fictionalised account of clandestine life as a PFLP operative, *The Trinity of Fundamentals*, written in an Israeli military prison, Wisam Rafeedie recounts how groups of fighters escaped soldiers by moving between walls, through tunnels under the camps and across its roofscape. The tunnels were, and still are, part of the urban fabric, not a separate medium from it.[23]

In January 1971, unable to put down the Palestinian insurrection, Moshe Dayan, who was now minister of defence, ordered Ariel Sharon, then head of Southern Command, to destroy the organised armed resistance in Gaza's camps. Al-Aswad was the most wanted person on Sharon's list, but it was only a year later, on 3 January 1972, that a small news item in the Israeli workers' newspaper *Davar* titled 'Hunt for Guevara, commander of "the Front in the Strip"' first introduced al-Aswad to the Israeli public. Dayan reportedly complained that the army 'rules Gaza by day, and Guevara and his companions rule it

during the night'.[24] The news item mentioned that in the search for 'Guevara' some 'terrorist bunkers were exposed'.[25] Al-Aswad trained guerillas in different refugee camps in north and south Gaza. Military documents suggest that the army knew about Palestinian 'bunkers' in refugee camps as early as January 1971. (The army referred to them as bunkers because it didn't always realise they had another exit.)

David Maimon, an Israeli officer of Yemeni origin and fluent in Arabic, was put in charge of Gaza City and its refugee camps of Jabalia and al-Shati during the early 1970s, under the command of Ariel Sharon. His book about this period captures the army's bewilderment at the spatial contraptions they encountered.[26] Entry shafts were located in 'courtyards, in destroyed buildings, in orchards, in homes…under stairwells, in wells, in clay ovens and disused toilets', he wrote. They were 'hidden and camouflaged by reeds, hay, sacks, barrels or crates'. Some entrances, he writes, lead to dead-end bunkers used for hiding, others were 'used by units of two to three fighters to facilitate hidden movement'. Some tunnels, Maimon wrote, started in wells that the army found in fields and citrus orchards. 'Particularly sophisticated,' he wrote, likely referring to al-Aswad's home, 'was the double wall, built parallel to the structural wall of a house, leaving enough space for movement. The opening to this gap is from the interior room, hidden behind a piece of furniture.'[27] Israeli officers were stunned to find tunnel entries within large underground complexes, with big clay ovens, workshops and storage facilities of the area's traditional pottery industry. Many of these ceramic workshops were in Jabalia, north of Gaza City, and the refugee camp nearby. For millennia, a shallow clay ridge east of Jabalia provided excellent material for ceramics.[28]

The first military drawing of tunnels I have found was prepared by an intelligence officer of the army's Southern Command. The drawing relates to an army raid on the Jabalia camp, not far from the ceramic-manufacturing centres, on 7 April 1971. The diagram shows a series of small houses laid out along the grid typical of refugee camps, each home with a small front

yard surrounded by a wall, a fence or cactus. A diagonal line drawn across one of the front yards is labelled ‘entry to a dugout’. The path leads to a rectangle labelled ‘hiding bunker’. The exit was to the alley. The length of this tunnel was only a few metres.[29]

Eviction

While the tunnels in al-Shati and Jabalia never ceased to evolve, the next chapter in the history of the tunnels took place some thirty kilometres south, in and around the border city of Rafah. But before diving back into the subsoil around this southern end of the Gaza Strip, we need to spend some time understanding the spatial and demographic transformation brought about across the surface.

On 25 June 1967, two weeks after the war ended, the Israeli government returned to the matter of displacing Palestinians from Gaza to Egypt. It discussed ways of ‘diluting’ the number of Palestinians in the newly occupied territories. Prime Minister Levi Eshkol wanted to annex Gaza, but said that ‘When thinking about the 400,000 refugees in Gaza my heart sinks.’ Moshe Dayan proposed that, ‘If we could evict 300,000 to other places, we could annex Gaza without a problem.’ Yigal Allon, now minister of agriculture, a portfolio that included the development of rural settlement, said that the preferable destination was al-Arish in Sinai and suggested starting deportations immediately. He argued that refugees living in ‘shabby huts’ would greet with enthusiasm the news that Israel intended to settle them in ‘beautiful population centres’.[30] Efforts to displace Palestinians to the Sinai Desert were not new. As noted in Part I displacement had been attempted and failed during the last month of the 1948 war, and by different means all throughout the 1950s.

Immediately after the 1967 war, Eshkol’s government deliberately maintained high unemployment to ‘encourage’ migration. ‘If we don’t give them water, they will have no choice because their orchards will yellow and die.’[31] The government provided incentives to those that agreed to relocate from Gaza.

Tens of thousands of Palestinians left Gaza for the West Bank and Jordan, a smaller number was displaced to Sinai. In February 1968 Eshkol established a unit that included the Mossad and Shin Bet tasked with encouraging immigration from Gaza. The team was looking for a third country to accept the refugees. The first suggestion was Brazil, where 'no one would know they existed'; later efforts focused on Paraguay, where in 1969 the Mossad reached an agreement for the government to absorb 60,000 Palestinian refugees.[32] In the event, no more than a few dozen actually went. In 1970 two young Palestinians entered the Israeli embassy in Asunción and shot a diplomat, putting an end to the programme.

De-urbanisation

Given the strength of Palestinian armed groups in the refugee camps, Sharon sought to conduct counter-insurgency via architectural means. The refugee camps, he believed, were not only the site of resistance – a built environment favourable for the defenders – but also the urban conditions that bred resistance. Rather than fight within the camps, Sharon decided the refugee problem would be designed out, achieved through the reorganisation of space.[33] 'It would be to our great advantage to eliminate them once and for all.' By destroying the camps and replacing them with housing estates, he imagined, Palestinians would have 'something to lose', the desire to return to their lands would disappear, and the refugee problem would be altogether undone. Dayan crassly summarised the principle that guided and still guides Israel's politics towards Palestinian refugees: 'As long as the refugees remain in their camps…their children will say they come from Jaffa or Haifa; if they move out of the camps, the hope is that they will feel an attachment to their new land.' Israeli politicians thought that while the Arab states, and even possibly a Palestinian one, could be fierce enemies, it is only the refugees that have a moral and historical claim to negate the right of Israel to exist. The war Israel declared on refugees thus aimed not only

at refugee camps but at ‘refugee-ness’ as a political identity grounded in urban conditions. Destruction, expulsion and rehousing were the means to eliminate it. These days it is the replacement of all refugee camps in Gaza with modern housing, and the elimination of UNRWA that is seen by Israel as the best means to undo this political identity.

The government’s plan for the transfer of refugees from Gaza benefited from Sharon’s attacks on the refugee camps. In 1971, Prime Minister Golda Meir, who replaced Eshkol in 1969, picked up the idea of expulsion by thinning out the camps. ‘It would be much more pleasant if it were done voluntarily…we must do it either voluntarily or by force…there is no doubt that they do not want the transfer.’ Dayan told the government the way he thought it could be done: soldiers would use paint to mark a number of buildings within the camps; ‘You give them 48 hours to move. You tell them for example: you are moving to al-Arish or elsewhere. We will take you, drive you, we will rebuild. First you give them a chance to move on their own accord [then] you take the furniture out of the house. Those that want to be driven are driven. If somebody is not moving their things voluntarily, you bring a bulldozer to destroy his home…If there are people inside the house you push them out and destroy the house with the furniture inside…The bulldozer starts destroying one house after the other.’[34] Israel Galili, another of Meir’s ministers, agreed: ‘I do not want to embellish this cruel act, but it is the lesser evil under the given conditions.’ The refugees were offered small plots of land and building materials to build their own homes in al-Arish, or elsewhere in Sinai, but fewer than 2,000 accepted.

In early 1971 Sharon started his campaign by raiding the al-Shati and Jabalia refugee camps in the north part of the Strip. The army later extended the operation to other camps such as al-Bureij and al-Maghazi in the centre. The meandering alleyways, the connected rooftops and the ground perforated with tunnels under them were ground down like an irredeemably infected structure. At the start of the operation Sharon ordered bulldozers to destroy all buildings, structures and vegetation around the

camps, effectively isolating their built-up area within an ungrounded 'security perimeter', making it impossible for anyone to enter or leave unnoticed. Local commanders instituted long curfews and started combing camps for those on the wanted list. Sharon then moved to redesign the camps by acts of destruction. He had bulldozers carve a grid of new roads wide enough for tanks right through the camp. The grid divided the camps into smaller controlled neighbourhoods that were no longer interconnected above or below ground. Six thousand homes were destroyed in 1971 and 1972. The architectural counter-insurgency also involved some selective acts of development. Traffic arteries across the Strip were paved to reduce the risk of landmines being buried in soft sand. Street lighting was introduced so places could be policed at night. Some of these streets would for years be referred to as 'Sharon Streets'. At night Palestinian armed groups shot at the lamps, seeking safety in darkness. Thirty-eight thousand people, nearly 10 per cent of Gaza's population, and more than half of the population of the camps which were raided, were displaced under Sharon's command.

Settlements

In 1971, standing with the government ministers on a high sand dune, Sharon pointed out where he thought Jewish settlements should best be located. He called his vision 'the five-fingers plan'. Each finger was to include an east–west traffic artery, from the Envelope to the coast along which settlements and military bases were strung. Each created a wedge that sliced the Strip into sections. The northernmost finger was to run along the northern edge of the Strip. The next was to run roughly through where they were standing along the northern bank of Wadi Gaza where in February 1972 the settlement of Netzarim was to be established. The name was a Hebrew adaptation of its nearest Palestinian town, al-Nuseirat, which the settlement was to overlook from across the wadi. A large military base was placed where the road to Netzarim intersected with Gaza's main traffic

artery, Salah al-Din Road. The Netzarim 'finger' separated Gaza City from the centre of the Strip.[35] The next finger, serving the settlement of Kfar Darom, separated the refugee camps of the centre – al-Bureij, al-Nuseirat, al-Maghazi and the town of Deir al-Balah – from the city of Khan Younis. The fourth finger separated Khan Younis from Rafah. It led to a settlement that was initially called Nahal Khan-Younis before it was renamed to Morag in 1972. This finger led to a block of seventeen settlements called Gush Katif, laid out parallel to the coast on the al-Mawasi dunes. The southernmost finger was to be built in the occupied Egyptian territory separating the Gaza Strip from the Sinai Desert, severing the trade routes operated by the tribal communities on both sides of the border.[36] These wedges would reappear as Israeli axes of military movement during Israel's invasion of Gaza in 2023. In total, following this plan, there were twenty-one Jewish settlements in the Gaza Strip. Together with the military bases built to protect them, and the infrastructure, security routes, buffer zones and fences serving them, they occupied close to half of Gaza's territory.

The southernmost of the fingers, right across the border in the occupied Sinai, was constructed in an area inhabited by the village of Abu Shinnar belonging to the Bedouin tribes of al-Tarabin, named after a beloved desert bird. The villagers cultivated small gardens, fields and fruit orchards in shallow depressions dug in the sand dunes according to the *mawasi* system. In January 1972 Sharon's forces raided the area, destroyed the orchards, blocked the water wells and deported the villagers. The story was exposed by Oded Lifshitz, a journalist from kibbutz Nir Oz, and his wife Yocheved, leading to a High Court case. Sharon appeared in court claiming the eviction was a 'temporary security need' – a legal trump card – and won the case. Soon after the 'development town' of Yamit was built on the lands of Abu Shinnar.[37] Both Oded and Yocheved Lifshitz were taken hostage by Hamas on 7 October 2023. Yocheved was released at the end of October 2023 and Oded was killed in captivity.

As a child in the 1950s Muhammad al-Aswad had witnessed Sharon's reprisal massacres. Twenty years later, in 1971–2, he became Sharon's top target. Al-Aswad survived Sharon's raids in Gaza but a month later Sharon was relieved of his command over the Gaza Strip. On the morning of 9 March 1973, al-Aswad was killed together with two of his deputies, Kamel al-'Amsi (known as Castro) and Abdul Hadi al-Haik. Earlier that week, the unit ambushed a military truck on the stretch of al-Rashid Road between al-Shati and the coastal cliff, killing a soldier. The army placed al-Shati under curfew. Al-Aswad's unit managed to escape into the camp and even exit it, arriving at their hideout, a two-storeyed house in the middle-class neighbourhood of Rimal which abutted the camp.[38] Soldiers broke into the house and noticed some loose floor tiles. They blew up a hole in the floor. The scene was like 'a stage where the curtain just rose,' one of the soldiers recounted. Under the floor was a headquarters complete with typing and printing machines, sacks of leaflets and money. From this room an escape route led to a small underground garage. This was the tunnel in which al-Aswad and his unit were killed. Dayan arrived at the scene to toast the event.[39]

Dayan relieved Sharon of command over the Gaza Strip after he switched between the polar types of action that define colonial counter-insurgency. For one school of thought in the army, the massive destruction in camps, the creation of unemployment, the ravaging of the agricultural sector and stopping development opportunities would bring about the desired forced transfer of Palestinians. The other school of thought saw poverty as the root cause of resistance. Officers holding this view sought to create jobs and build housing. Both rationales conceived of conditions of life as a route to pacification. One acted to dial them down, the other to dial them up. Both approaches had an architectural dimension – one favoured destruction, the other development. In reality these approaches were continuous rather than contradictory. Destruction in the camps was a means to bring

about alternative housing elsewhere. In early 1971 Dayan ordered Sharon to generate massive destruction. In early 1972 Dayan replaced Sharon when he wanted to promote development. (The current destruction in Gaza and the development plans that came in its wake are an echo of these types of approaches, as we'll see in Part III.)

As part of his new approach to counter-insurgency Dayan allowed more Palestinians from Gaza to work in Israeli cities and settlements.[40] Hundreds of thousands travelled daily to work, building homes on and harvesting the land that used to be theirs. Even though they received the lowest wages in Israel, Palestinian workers brought home salaries that were many times what they would earn in Gaza. Per capita income was up 80 per cent, according to Israeli sources.[41] In 1973, though higher employment was reported in the Gaza Strip, it was mainly in manual and construction works. Palestinian teachers, doctors and engineers were forced to leave Gaza, mainly for the Gulf, to find work. Dayan told the government: 'In the Togolese Republic in West Africa people still had good memories of German colonial rule before the First World War…the Germans left orchards and culture. Israel…should follow the example of benevolent colonialism.'[42] This never happened. Israel restricted agricultural and industrial development inside the Strip. Israeli banks refused to give loans to Palestinian farmers, the government banned importation of various types of machines and materials, prohibited well-digging, erected more dams upstream of Wadi Gaza, allocated the aquifer waters to Israeli settlements and reduced water quotas to Palestinian farmers, and limited the export of agricultural produce from Gaza. American political economist Sara Roy called this process 'de-development'.[43] Gaza became a captive, dependent economy, providing cheap labour and forced to consume Israeli products.

Canada and Brazil

When Israel withdrew from Gaza in March 1957, as part of an

agreement that ended the 1956 Suez War, the United Nations Emergency Force (UNEF) was established and deployed to Sinai and Gaza. Brazilian and Canadian UN troops built their bases on either side of the Palestine–Egypt border in Rafah. Shortly before the 1967 War, Nasser expelled the UN troops from these camps and closed the Red Sea to Israeli maritime traffic. Not all UN soldiers had time to leave and several were killed in the Israeli blitzkrieg. After the war Israel controlled both Gaza and Sinai. In 1972 Israel turned the Brazil and Canada bases, which by then had been empty for five years, into a nucleus of new housing development for families from the partially demolished refugee camps of al-Shati, Jabalia and al-Maghazi in the north of the Gaza Strip. (Amongst the families dislocated to Rafah was that of Abu Samhadana, who we will encounter later.) On the dunes around the centres of the UN bases, Israeli contractors marked a rectangular grid. Refugee families each received a small plot, at the centre of which was a concrete platform with connections to water and electricity. Refugees were given concrete blocks and expected to build their own homes. The single-storey structures were provided with asbestos sheets for roofs. They were only slightly larger than those that Sharon's forces destroyed in the camps further to the north. Palestinian architectural historian Fatina Abreek-Zubiedat has shown how the Israeli architects that provided these rudimentary structures condescendingly believed their system would reconnect refugees with traditional ways of living.[44]

UNRWA recorded 5,370 refugees sent to the abandoned Canadian base, which was just outside the borders of the Mandate territory of Palestine, but was still served by the Rafah municipality.[45] Both sides of the old Egypt–Palestine border were occupied territories and movement across the border was unimpeded.

The following year, 1973, Israel displaced a further 2,820 refugees from northern Gaza into 422 self-build plots in and around the Brazilian UN base, on the Palestine side of the border. In the following six years more than a hundred houses were

added. The Israeli government presented foreign visitors with new housing schemes as a humanitarian measure. The naming of the Canada camp started as a joke, recalled Mohammed al-Najjar, the camp director on behalf of UNRWA. 'They had just built another project to the east the people called "Brazil" because a UN peacekeeping force from Brazil had once camped there before 1967. We said, "Okay, if you are Brazil, then we are Canada."' Israel called the places the Brazil and Canada neighbourhoods but Palestinians insisted they were refugee camps – Mukhayyam Kanada and Mukhayyam Brazil. According to UNRWA a rough total of 10,000 homes for refugees were built in the Brazil and Canada camps.[46] The new housing developed to pacify refugees, it became clear years later, not only failed to subdue Palestinian resistance, but became new centres of it.[47] Later, as we shall see, when the first tunnels across the Rafah border led out of the Canada and Brazil camps, the joke became 'only Palestinians could dig a tunnel from Brazil to Canada'.

Two Rafahs

In 1979 the Israel–Egypt Peace Accord, brokered by the US in Camp David near Washington, was signed at the White House. Israel was to retreat by the end of April 1982 from the entirety of Sinai and remove all its settlements and military bases from Egyptian territory. Egypt agreed to Israel's demand to leave the Gaza Strip under Israeli occupation. A hard border between Palestine and Egypt was to be erected for the first time in history. From 1906 when the border was first drafted between the British and the Ottoman empires until 1948 it was marked by nothing but a stone pillar on the coastal route as one drove south-west of Rafah. Between 1948 and 1967 the Egyptian army controlled both sides of the 1906 border, and though they erected a small checkpoint on the road and by the railway line as they passed next to the pillar, the remainder of the roughly 200-kilometre-long border was unfenced. From the time of the 1967 occupation to 1982 Israel controlled both sides of the border and it was left

unfenced. During all these decades the town of Rafah grew across the border.[48] The bulk was on the Palestinian side, but the Egyptian side included a commercial centre that provided services to the tribal communities of the area.

The Camp David accords specified that the 12-kilometre-long border line between Gaza and Sinai was to be fenced. The fence would run down the middle of a buffer zone, one hundred metres wide, in which every structure was to be destroyed. This border strip came to be known as the Philadelphi Corridor. The levelling and fencing of the Philadelphi Corridor took place between January and April 1982. Though it ended up being only forty to sixty metres wide, narrower than the agreement specified, its creation resulted in the destruction of 600 buildings. On the day the border was sealed, 26 April 1982, Israel declared a curfew. The following day the geopolitical and economic reality had completely changed. There was only one link between the two Rafahs, a pedestrian crossing through the security fences. The situation reminded foreign reporters of Berlin and Tijuana. The border crossing was nicknamed Checkpoint Charlie.[49] Rafah was a divided city. The old Via Maris – the trade route which had run for centuries along the coast of North Africa, Palestine and the rest of the Levant – was now truncated by a border, becoming two dead ends. The city's economic situation rapidly deteriorated. Many of the shops on both sides closed, and the owners were forced to search for work as day labourers. The accord allowed for the residents of the Canada camp to move back to occupied Gaza but Israel used all sorts of bureaucratic means to delay their return. They remained in Egyptian territory for almost two decades without residency and work permits.[50] At the end of April 1982 some members of the tribal societies expelled by Israel for the sake of the settlements of northern Sinai returned to reclaim their lands on the Egyptian side of the border.[51] Unemployed, and with their families, friends, work and business connections on the other side, the residents of the Canada camp and the returning clans would be amongst the first to inaugurate the cross-border tunnels.[52]

Dugouts

The first cross-border tunnels were dug as soon as the fence was erected. From day one, Palestinians crawled through the soft sand under the fences. The first cuts in the barbed wire fence were discovered on 27 April, a day after the border fence was completed. Families stood on rooftops on both sides of the buffer zone shouting messages in code. Objects of all kinds – letters, food and sometimes money – were put in plastic bags with teenage boys trying to throw them across the buffer zone. After a few days entire sections of the barbed wire ended up littered with colourful plastic bags. At the end of May, the Israeli army recorded 250 attempts of 'infiltration'; there must have been many more.

There are different accounts of how the tunnels began. Collecting oral testimonies from the time, anthropologist Hadeel Assali writes that it 'is said that the first of Gaza's tunnels involved an old water pipe, a cat, and a string…the story goes that Palestinians on one side of the *silik* [fence] tied a rope to a cat and coaxed it through the underground pipe to the other side…In another story, a man crossed the border to reach the other side of his land. His dog smelled him and dug under the fence, opening another pathway.'[53]

Less than two months after Israel completed the evacuation of Sinai, the Israeli army – now with Ariel Sharon as minister of defence – invaded Lebanon. Three months later, between 16–18 September 1982 Christian Falangists, with the Israeli army overseeing, conducted a massacre of thousands of defenceless Palestinian refugees in Sabra and Shatila. All eyes were on Palestine's northern border with Lebanon. But it was the inhabitants of the southern region – people who tried to cross the border to find work, to connect with family members, or trade – who were the ones to evolve the most effective architectural project of Palestinian resistance. Changing the political realities by digging through the soil, they gave another, situated and bottom-up, meaning to the term geopolitics.

On 17 August 1982, two residents of Egyptian Rafah were caught crawling under the fence in what the army and Israeli newspapers called a 'sand dugout' (*mahporet hol*). The word 'tunnel' was still not in use.[54] Nine months later on 5 May 1983, the Israeli press reported the capture of a man in his thirties and a seventeen-year-old girl who tried to cross the border from Gaza to Egypt through what the article described as 'a shallow tunnel' dug under the fence. This may have been the first time the word 'tunnel' was used as a descriptor in this context. The girl was pregnant outside of marriage and had managed to hide her pregnancy from her family for eight months, before attempting to escape to Egypt to give birth. Both were arrested by the Israeli army. Their names and fates were not reported.[55]

Many of the attempts to cross the Rafah border via tunnels were for a day's work. 'The ideal is to work in Israel and live in Egypt. After 15 days of work in Israel I can live for two months in Egypt,' reported a resident of the Canada camp. Crossing at the single checkpoint in Rafah required a fee, a passport and a travel permit which in turn necessitated interrogation and inspection by both the Egyptian and Israeli officers. Often the border crossing was closed for months without a stated reason. The tunnels offered a fast and efficient alternative.

Cocoa, chocolate, sweets and oil went from occupied Gaza to Egypt. All across northern Sinai, and especially in al-Arish, there was a robust market in Israeli candy. From Egypt came processed Dutch cheese, canned meat, hashish. Gold, silver, shekels, Egyptian pounds and dollars went both ways. The tunnels created a short but essential bypass that reopened the Via Maris. The inhabitants of the region were not crossing the border, the border crossed them, as the famous slogan of border activists goes.

A year into the establishment of the border in Rafah and most crossings were no longer short dugouts under the fences but longer crawling tunnels which started and ended in buildings on both sides.[56] In May 1983 the army increased the frequency of patrols along the fence. Its contractors poured concrete into a trench under the metal fences to stop people crawling under. This

was Israel's first underground barrier. That same month only twenty attempts to cross the border were registered.[57] At the end of August 1983 the army installed twenty-metre-tall guard towers along the fence. The Israeli press reported that they 'reduced the number of infiltrations from Sinai', though in reality, as the Israeli army climbed up, the Palestinians dug further down where the local soil – a mixture of sand and loess – becomes more stable. Increased stability enabled tunnels to grow longer. The added length allowed the entrances to be set away from the first row of buildings abutting the buffer zone. The deeper and longer the tunnels became, the more the traditional skills of well-diggers became essential. They were familiar with ways of excavating through the subsoil and of reinforcing the shafts. There were also physiological adjustments necessary. Tunnellers, like well-diggers, must adjust to the low-oxygen environment.[58] The speed of breathing and heart rate accelerate, red blood cell production increases to allow the reduced available oxygen to power the brain and muscles. This is similar to the way that visitors to La Paz in Bolivia, Bogotá in Colombia, Mexico City or Xining in the Tibetan Plateau of China acclimatise to high altitude.

In May 1984, the Israeli army discovered a tunnel connecting buildings on both sides of the border. 'The Hilton of tunnels', as the Israeli press reported, was sixty metres long, slightly longer than the buffer zone, and two metres deep. Its structure – sixty to eighty centimetres wide – was reinforced by wooden frames and tin sheets. The tunnel had another innovative element: a plastic tube about twenty centimetres wide, of the kind used for domestic sewage or agricultural irrigation, was laid along its entire length. One puts what one wants to send over the border – food, written messages, hashish, dollars, gold – in nylon bags sealed with tape, fills the pipe with pressured water and the package sails through. The Egyptian army located the tunnel when they noticed a mound of sand piled near one of the houses by the border. From then on, excess soil was the most common indicator searched for by armies on both sides. Palestinians started hiding the excess soil in sacks. On the Gaza side the tunnel ended in a small concrete block

structure that the reporter called a ‘terminal’. It had a small refrigerator and a few stools. The terminal was demolished. An Israeli army bulldozer also dug a trench along the buffer zone, slicing through this tunnel, and unexpectedly cuting through a number of others.[59]

Intifada

On 18 December 1987 an Israeli truck driver crashed into a car killing four Palestinian men as they returned from work near the Jabalia refugee camp in the north of the Strip. A spontaneous intifada or uprising began in Gaza and spread to the West Bank. The intifada was a mostly unarmed insurrection which encompassed strikes, demonstrations and stoning of Israeli military bases and cars. Palestinian popular committees organised locally without the command or control of the PLO, and a new generation of local leaders emerged. Hamas, an acronym for the ‘Islamic Resistance Movement’, was formed by the cleric Ahmed Yassin, a refugee from the village of al-Jura near al-Majdal north of Gaza City. Its members came from an Islamic charity affiliated with the Muslim Brotherhood. Israel had previously seen the charity as a counterbalance to PLO factions such as the PFLP and Fatah and did not actively obstruct its growth, but Hamas slowly gained primacy in the armed resistance.

The first intifada gave the tunnels a strategic role. Operatives wanted by the occupation escaped to Egypt and other operatives came in. It also was a channel for the import of light arms. Israel responded to the uprising with crushing violence and the siege of Gaza tightened. In 1989 Israel established the ‘travel pass’ system. Every Palestinian from the West Bank and Gaza required a permit to exit the occupied territories. In January 1991, when the US-led invasion of Iraq began and the intifada showed no signs of abating, the closure was further tightened.[60] Presented as a temporary measure until things cooled down, the closure has since further tightened, becoming Israel’s main tool in its attempt to break Palestinian unity, separating Gaza from Jerusalem and

the West Bank. At the same time that the process that led to the end of South Africa's apartheid – 'separation' in Afrikaans – began, the Israeli policy of *hafrada* – 'separation' in Hebrew – was reinforced by more and more physical elements such as fences and walls and by bureaucratic ones such as permits.[61] Unemployment in Gaza grew and the economy declined. Palestinian workers in Israeli factories and farms were replaced by migrant workers as well as by Jewish migrants from Ethiopia. Large waves of migration to Israel from the disintegrating Soviet Union began.

The intifada, and the Gulf War of 1991, led to the Israeli–PLO Declaration of Principles, or the Oslo Accord, signed on the White House lawn in September 1993. In the West Bank the accord gave the Palestinian Authority (PA) a degree of civilian administration and limited autonomy over some 200 separate territorial islands floating within a larger occupied territory run by the Israeli army and the settlers. In Gaza, Israel remained in control of the settlements, military bases, the main traffic arteries and the Philadelphi Corridor.[62] Ten months after the signing, in July 1994, PA president Yasser Arafat's convoy with dozens of PLO personnel drove from Cairo to Gaza City to take over the tasks of local government. When the convoy passed Rafah, a small crowd of several dozen Palestinians from the Canada refugee camp, who were still stranded in Egypt, stood in protest with signs reading 'Don't forget Canada camp.' Arafat reportedly glanced over, waved, and the convoy drove on.[63]

The Oslo process did not end but rather deepened the politics of separation. In 1994 Israel erected a new fencing system around the Strip. The number of exit permits from Gaza was further reduced. Palestinians from Gaza were no longer allowed to drive out of the Strip.

The subterranean connection to Egypt expanded and deepened in the shadow of Gaza's growing isolation.

How to Build a Tunnel

The architecture of tunnels evolved in relation to two main factors: the politics imposed on the surface and the arrangement of soil layers beneath it. Near Rafah, the first three kilometres from the shoreline are sand dunes. Under the sand dunes the groundwater is high. The area is not suitable for tunnelling. A flat plain of pale brown soil composed of a mixture of loess and sand begins south-east of the dunes and extends all the way to the armistice line. Sandy loess is a good medium for tunnelling. Sand gives this soil its lightness, loess its malleability. It was through this soil that the technique of tunnelling developed since 1982 by trial and error.

Over the decades several texts by, and interviews with, tunnel diggers outlined the practical elements of digging a tunnel. One of the clearest is titled 'practical steps in tunnel building'. It was published in 2008 but seems to refer to earlier types of tunnels that were more common during the late 1980s and throughout the 1990s.[64] The first step, the guideline states, is not so much material as it is social. One needs to establish a connection with a person or a group on the other side of the border. Such connections are based on trust as the digger must be content that the person they are working with is not an undercover police officer or an informer. Family, clan or tribal relations provide the best guarantee against betrayal. With covert communication the entry and exit points are agreed. The person managing the tunnel's construction and operation is known as the 'owner'. The person arranging the exit point is referred to as the 'secretary', which in Arabic – *al-mawthuq* – means 'the trusted'. The entry and exit points should be inconspicuous, close, but not too close, the text claims, to the border. It is recommended that buildings used for entry or exit have more than two floors. Rooms on the ground floor where the tunnel shaft is dug should be kept free to store the excess soil until it is disposed of. It is recommended that family members continue to live in the house so as not to arouse suspicion. The 'owner' rents several rooms from the family and offers a share of the proceeds in return.[65] The entry shaft is often referred to as *bir* in Arabic, a 'well'. An Egyptian journalist

described a tunnel he was taken to see as ‘a Bedouin’s desert well’, identifying its origins, ‘except that it was lit all the way down’.[66] The digging is undertaken ‘using instruments designed for well mining’. The lead worker is referred to as *al-haffar* – the ‘digger’ – usually a nimble young man in his late teens or early twenties. It can take five months to dig a tunnel. Another document suggests that usually ‘the number of workers needed is eighteen young men between the ages of 17 and 35’.[67] The speed of vertical excavation down the ‘well’, another document suggests, is four to eight metres a day. The digging of the horizontal section of the tunnel seems to be faster, six to twelve metres a day. The ideal width of a smuggling tunnel is seventy centimetres (these crawling tunnels were common in the 1980s and 1990s). Wood props were erected after every stage of excavation. Workers are paid for every metre dug and reinforced. Younger teenagers descend behind the cutter and transfer the loose soil into barrels cut length-ways in half. The barrel is pulled out by cables attached to pulleys and motors. An intercom, referred to as ‘*al-makhshir*’, an Arabicised Hebrew word for an ‘instrument’, allows for coordination between teams inside and outside of the tunnel. A shout or a whistle orders the workers into small niches cut into the sides of the tunnel before the motor pulls the barrel. Once outside, the soil is put into sacks which are stored until the moisture evaporates. The dry soil is discreetly disposed of. Some tunnels had electric cables extending the length of the tunnel with ‘one light bulb for every three metres’.[68]

The direction of movement is established with a compass from the roof over the entry point. The distances are derived from maps or satellite images. Underground, the distances are measured by tape. There is always a discrepancy between the map and the terrain. The longer the tunnel, the larger the discrepancy. In shallow tunnels, when the ‘digger’ nears the destination an iron pole is hammered from below up into the surface. The secretary communicates corrections. The exit shaft is referred to as *al-nabe’* or ‘spring’. When the tunnel is complete, the ‘digger’ doesn’t come out but returns to the entry ‘well’. An

armed person is sent through to establish first contact and make sure the 'secretary' has not been lured in by the Egyptian police. If all goes well a small celebration follows.[69] Towards the end of the 1990s when tunnels went as deep as eight to ten metres, poles could no longer reach the surface from below. It also became difficult to dig vertically upwards from this depth. Wells had to be dug first on both sides of the border. A tunnel would evolve from the bottom of one well and diggers had to find the bottom of the other well in the dark recesses of the subsoil. It is easy to miss the bottom of a shaft. Systems for underground navigation had to be developed. Sound or music played from the bottom of the destination well provided orientation for those digging towards it. Soil is a good medium for sound, but transmission is a function of soil type and density. Compact and moist at several metres deep, sandy loess transmits sound better than looser drier sand. From the bottom of the receiving well the sound of metal scraping against hardened soil is also audible in the event that two teams dig towards each other from different directions. The sound conductivity of soil is the reason that for the Israeli army the most effective underground detection is through geo-phones. Acoustic sensors were designed and placed underground to detect tunnel excavation.[70] Lacking the ability to see, in the subsoil, both navigation and detection became an auditory practice.

The navigation between the bottoms of tunnel shafts mirrors the history of navigation across desert environments. Palestinian political scholar Mansour Nasasra describes navigation across desert routes as a complex practice involving 'route planning, logistics of movement, possibilities available through innovation and effort, location points and topographic transitions, wayfinding rules and heuristics'.[71] Trade caravans navigated the Sinai Desert between a network of wells, which were spaced apart at a distance determined by the amount of water that the goatskin flasks in the caravans could carry. Navigating down through the desert of the subsoil, those opening the underground trade routes continued navigating between wells, except that now they had to do so between their bottom ends.

The connection between the bottom of a shaft and the horizontal part of a tunnel is the most dangerous part of the process, as the soil weakens at these points and can lead to mutual collapse. The deeper the tunnel, the more stable the cavity is, and the safer the connection, though both the horizontal and vertical sections have to be reinforced before any connection is attempted. Prefabricated concrete elements were introduced to facilitate such connections. As tunnels became longer and deeper, they've also required ventilation, and air shafts have had to link up to the surface and be camouflaged. But as diggers soon learnt, when dry air circulates through tunnels, it dries the exposed loess underground, reducing its cohesiveness which can sometimes lead to the collapse of a tunnel. This was yet another reason that precast concrete reinforcement had to be introduced.

Abu Samhadana

Deeper and longer tunnels demanded a higher level of engineering and infrastructure. Trafficking goods required the establishment of connections with traders and the transporters of goods on the Egyptian side, warehousing, and overground transport in Egypt. The Egyptian police had to be paid to turn a blind eye. This required the coordination of networks of operators, something to which extended clans separated by the border were ideally suited. The cumulative experience necessary for excavation and trade led in the mid 1990s to the gradual consolidation of tunnel construction and management in the hands of a few families.

Two of the biggest of these families were the Abu Samhadana and Abu Riash. The families were each affiliated to another Bedouin tribe expelled from the Beersheba district in 1948. Abu Riash were part of the al-Tiyaha tribe which originally inhabited the northern tributaries of Wadi Gaza. The Abu Samhadana family – one of twenty clans that make up the al-Tarabin tribe in Palestine – were expelled in 1948 from the southern tributaries. Both al-Tarabin and al-Tiyaha ended up divided between the

Negev, the West Bank, Gaza and the Egyptian side of the border. This spread both necessitated and facilitated the trafficking of goods across borders. When expelled into Gaza at the end of 1948, the Abu Samhadana family first settled in al-Maghazi refugee camp on the banks of Wadi Gaza as the area was densely settled, before the Nakba, by tribal societies. During the Israeli army raids of 1971–2, under the command of Sharon, the Abu Samhadana family was forced southwards to Rafah. When Israel withdrew from Sinai in 1982, tribal connections were left just on the other side of the border.[72] The separation contributed to their fortune as it helped the family construct, maintain and operate tunnels.

The profit extracted from the control of tunnels led to the emergence of wealth in the previously most marginalised part of the Strip, far from Gaza City and some of its powerful families, which were often associated with the PA. They had relatively little interest in the tunnels because they benefited from monopoly-like concessions on imports that came through the Israeli checkpoints.[73] From two dead-end towns, the underground connections turned Rafah into a trading hub. Profits were invested in large family homes on both sides of the border and in building armed militias grounded in family ties. PA security personnel were wary of veering into the border area and the tunnels were kept away from their direct control.[74] The PA's strongman in Gaza, Moussa Arafat (a cousin of Yasser Arafat), and his right-hand man, Mohammed Dahlan, had to cede control over the Rafah area and sought instead the cooperation of members of the Abu Samhadana family.

In the Abu Samhadana family there were two prominent brothers, Sami and Jamal. They were both born in al-Maghazi, in 1962 and 1963 respectively. From the early 1980s they were active in the armed resistance in the Rafah area. Two other brothers were killed by Israeli forces. Sami was detained a number of times during the first intifada of the late 1980s. Jamal had escaped to Egypt in 1982, likely through a tunnel. He spent two years in Damascus and in a Fatah training site in Tunis. Later

he was sent to study in a military academy in East Germany. He left for Algeria in 1989 after the Berlin Wall fell, and he was in Baghdad when the 1991 Gulf War began. Jamal returned to Gaza during the Oslo years of the mid 1990s, travelling overground as a PA security official. By that time Sami, who remained in Gaza, had already established control of a large part of the tunnel economy in the border area. He leveraged this power to receive a high security position in the PA and later became head of Force 17, Fatah's special operations unit. Working from within and outside the PA helped him consolidate further control over the Rafah area and the tunnels. In return he transferred some of the profits from the tunnel trade to Arafat's private fund, which provided the latter with unregulated power. Arafat's way of holding on to power was by instigating competition between the different forces he established. In September 1995 tensions escalated into gunfights between Abu Samhadana's Force 17 and Gaza City Police over the latter's overzealous attempts to arrest fighters wanted by Israel.[75]

Israel, which still controlled the Philadelphi Corridor overground, expanded the buffer zone by demolishing the first rows of homes along it. It also established a dedicated engineering unit, Yahalom, to search for and destroy tunnels. In trying to detect them, the army sought advice from geologists who marked the areas they thought were most suitable for tunnelling. In 1996 Israel brought a long-arm mechanical digger known as a 'trencher' which dug trenches parallel to the border in the areas most susceptible for tunnelling, to slice through cross-border tunnels. The following year, the army brought in another mechanical instrument called a 'driller' capable of boring vertical holes fifteen metres deep. The 'drillers versus diggers' standoff resulted in the tunnels going even deeper.

Throughout the 1990s, the tunnels in Rafah broke through the layer of sandstone and moved further down into the soft and malleable layer of clay some ten to twelve metres under the surface. The sandstone became something of a 'roof' for the tunnels that ran under it. The increased stability provided by

depth meant that tunnels could extend even further, up to several hundred metres. The added stability also allowed tunnels to bifurcate. A main route crossed the border, but on both ends it split into secondary branches leading to different basements, greenhouses, or chicken coops. When the Israeli or the Egyptian armies destroyed one of the connections, trade kept on flowing through other tributaries. During the years of the Oslo Accord between 1993 and 2000, the Israeli army claimed to have destroyed some sixty tunnels. But the army counted entry shafts, which were more numerous.[76]

Tunnels gradually evolved from straight routes into weblike structures. As my colleague Nour told me, the physical network underground had to rely upon 'social networks' overground. A tunnel network could connect only to the homes of people and family members bound within a network of trust and bypass others. The tunnel path was, to some extent, a social media.

The Second Intifada

In September 2000, the Oslo process collapsed into the al-Aqsa Intifada (also known as the Second Intifada). Soon afterwards Sami Abu Samhadana left for Egypt for medical treatment. Israel barred his re-entry, but he managed to return through one of the family tunnels. During the last years of the Oslo process Jamal Abu Samhadana started shifting alliances. He was arrested and imprisoned by the PA – which was operating as Israel's security subcontractor – for working with Hamas's military wing, the al-Qassam Brigades. At the end of 2000, when the intifada began and the PA released some of its prisoners including Jamal, he established the Popular Resistance Committees (PRC). The group's experienced teams of diggers, the same group that was digging cross-border smuggling tunnels, started digging tactical tunnels used in the armed struggle. Being an independent organisation, the PRC was able to equally offer 'subterranean services' to different armed groups such as the PFLP, PIJ and Hamas.

During the al-Aqsa Intifada, the 'Bedouin Battalion' of the

Israeli army, set up in 1985, was assigned to the Philadelphi Corridor along the Gaza border with Egypt and tasked with the search for tunnels. The soldiers were young men recruited from amongst the Bedouin Palestinian families that remained in the Negev. Dispossessed of their lands and concentrated in impoverished townships, these communities were driven into poverty, which in turn drove them to become salaried soldiers in the Israeli military.[77] Being assigned by the army to the Rafah area cruelly pitted them against their kin on both sides of the border. Soon these soldiers became the target of a new type of warfare undertaken from the subsoil.

One of the main army command centres along the Philadelphi Corridor, code-named Termit, was located near the Rafah border crossing. Its strategic location made it a lightning rod for all sorts of attacks: Molotov cocktails, grenades, sniper fire and RPGs. The structure was gradually covered with a patchwork of metal and camouflage netting. On 26 September 2001, the PRC, in a joint operation with al-Qassam, dug a tunnel under it. Two hundred kilograms of explosives tore off a part of the building. There were no fatalities, but the army now realised that their bases' most vulnerable flank was not the walls or the roof, but the floor separating the surface from the subsoil. The tactical use of explosive tunnels mirrored the use of air power – both were a means of transferring explosives across borders, bypassing ground fortifications in three dimensions.

The army demolished the remains of Termit and started building a series of fourteen-metre-high fortresses made of modular metal plates which the soldiers called 'Terminators' along the Philadelphi Corridor.[78] On 17 December 2003, PRC and al-Qassam exploded a subterranean charge in a 200-metre tunnel that ended under another Terminator, bringing it down.[79] On 12 May 2004 an explosion under the Philadelphi Corridor created such a deep crater that it swallowed an entire armoured vehicle. On 27 June 2004 a 500-metre tunnel destroyed a military base in the Katif settlement bloc, killing seven soldiers. On 7 December 2004, a double agent lured a group of Israeli soldiers

above the path of an explosive tunnel east of Gaza City. The attack was revenge for what Palestinians perceived to be Israel's killing of Yasser Arafat, who had died in France on 11 November 2004, after mysteriously falling ill following months during which he and the PA leadership had been under siege in his Ramallah headquarters. Unlike previous attacks on Israeli outposts this one did not occur near the Egyptian border. The tunnellers of Rafah had moved north.

It wasn't until the year 2000, just before the collapse of the Oslo process and the start of the intifada, that the last families from the Canada camp, left stranded in Egypt, returned to occupied Gaza. The remaining structures of the old camp were appropriated by local clans living on the Egyptian side of the border. For the returnees, the PA and the Israeli army built a new refugee camp in an area known as Tel al-Sultan, between Rafah and the coast, which became known locally as 'Canada Camp Palestine'. The place was designed by Israeli planners with a unique layout. It was located on the sand slopes of Tel Zoroub – a sharp sandstone hill along the border with Egypt – where the Israeli army had a permanent outpost. Around the hill the army paved a semicircular route – later known as Ibn Sena Street – from which radial routes opened like a fan. From these routes the army could see and shoot deep into the newly established camp. The new Canada Camp in Tel al-Sultan was close to the border fence and soon cross-border tunnels were dug under the military outpost in Tel Zoroub to Egypt.

In the early 2000s the army increased the search for tunnels and the rate of house demolition. Wherever a tunnel shaft was discovered, the army demolished not only the house that harboured it, but rows of homes all around it. This was an attempt to force camp residents to keep tunnel operators away from their neighbourhoods. A few years after Tel al-Sultan was constructed, its western margins along to the Philadelphi Corridor were already gnawed at by Israeli army bulldozers as they widened the buffer zone to 400 metres. On 16 March 2003, an American university student named Rachel Corrie, who was in Tel

al-Sultan with the International Solidarity Movement (ISM), was attempting to protect a water facility known as the Canada Well built in the camp in 1999 with Canadian funding (for its namesake, Canada started 'adopting' the camp). The ISM tactics of using internationals to obstruct the army did not work on this occasion. A video recording of Corrie's last seconds shows a bulldozer moving forward with its front loader stabbed in the ground. Corrie fell into the excavation and the fifty-ton bulldozer crushed her. (The Canada Well survived on this occasion, but would not survive the genocide when it was ceremonially blown up in 2024.[80])

Between 2000 and 2004 Israel destroyed close to 1,800 homes in the Rafah area, many of them in Tel al-Sultan/Canada and Brazil, not only because they harboured tunnels, but because the army thought that they might do so.[81] During these years the army claimed to have uncovered more than a hundred tunnels. The inflated number, based on a count of discovered shafts, if on anything, was used to justify the widespread destruction.

From 2002 Jamal Abu Samhadana's teams of tunnellers had left Rafah to dig tunnels in the northern part of the Strip. Hamas's strategy of 'above and below' – attributed to Mohammed Deif, commander of the al-Qassam Brigades from 2002 – required excavating concealed tunnel shafts for launching rockets and mortars. Deif knew the early tunnellers of Rafah. In the late 1980s, he shared a prison cell with Sami Abu Samhadana.[82] At the top of Israel's most-wanted list, Deif had reportedly spent much of his time in the tunnel network.

Digging tunnels in the north of the Gaza Strip required negotiating different soil strata. Close to the coast in and around al-Shati, tunnels were excavated within the hard sandstone of the coastal cliff. The town and the refugee camp of Jabalia were located near clay hills which made an excellent medium for tunnelling.

Around the same time, in the early millennium, the army started employing armed drones. They could stay in the air for hours and became omnipresent in Gaza's skies. Streets in refugee

camps began to be covered with nylon sheets to make 'overground tunnels' meant to hide the movement of operatives.

'Disengagement'

Relentless resistance achieved one of its aims. In 2005 Ariel Sharon, now prime minister, dismantled the twenty-one Jewish settlements and all military bases in the Gaza Strip. The 'disengagement' was completed in September. The army destroyed all the buildings in the settlements, which despite them being on occupied territory appeared like quiet suburban house and garden communities with red-roofed homes. An Israeli journalist who visited the Gaza settlements a few days before the evacuation described 'mounds of building rubble piled at the centre of what used to be private gardens…the disturbing stench of food remains…pools of water and sewage…endless swarms of flies…and miles upon miles of nylon packing rolls'.[83] The only structures remaining in the swamp of debris and liquid waste were the nineteen synagogues of Gaza. One of them – designed as a three-dimensional Star of David and built of reinforced concrete (in order, as its architect stated, that 'Jews rid themselves of their diasporic complex') – best embodied the architecture of Israeli occupation. One of the young leaders of the settler movement campaigning against the evacuation was Bezalel Smotrich, who as minister of finance nearly twenty years later during the genocide would push for the expulsion of all Palestinians from Gaza and the renewal of the settlement project. Like many in the settler movement, he saw the 2005 withdrawal from Gaza as the 'original sin' that led directly to 7 October 2023. Many of the children of the settlers that were evacuated in 2005 would become soldiers in 2023, vowing to undo the 'mistake' of the evacuation. While in the previous attempt at Gaza colonisation Jewish settlements were built as wedges between Palestinian cities and camps that were largely left in place, this time the settler movement advocated the destruction of all Palestinian built-up areas and erecting the settlements on a *tabula rasa*.

The evacuation of the Gaza settlers did not reduce the overall number of Israeli settlers in the territories occupied in 1967. In the year following the removal of the 8,500 Gaza settlers, 12,000 settlers moved to the West Bank. Some of the Gaza settlements and military bases were relocated to the Envelope. The headquarters of the Gaza Division moved from the base near Netzarim to a base near the kibbutz settlement of Re'im.

Israel claimed that it had ended the occupation of Gaza. The UN and most international bodies, however, still considered Gaza an occupied territory. It was only the means of occupation that had changed: control previously enacted on the ground was relocated to the perimeter, and to the airspace above. After the evacuation Israel added a second layer of fencing around the entire length of Gaza. The tunnels, though, followed Israeli forces, diving under Gaza's perimeter fence to the Envelope. Mortar and rocket fire went over the fence in the same direction. It was at this time that the term 'Envelope' was officially adopted by the government, defined as a strip seven kilometres from the perimeter fence, granting state subsidies to all those living within the range that Palestinian rockets then had.

On 25 June 2006, a 650-metre-long tunnel leading from a concealed shaft in Rafah passed under the bombed-out Oslo-era Palestinian 'International Airport' of Dahania, south of Rafah, crossed under Gaza's perimeter fences and emerged a few hundred metres outside Gaza, near a military outpost. The operation was designed and led by Mohammed Sinwar with the aim of capturing soldiers to exchange for Palestinian prisoners, including his older brother Yahya who had been in an Israeli prison since 1989. The tunnel was excavated by Jamal Abu Samhadana's team of al-Tarabin tunnellers. Abu Samhadana did not live to see the result of the operation; he was assassinated in an Israeli air strike less than three weeks before Palestinian fighters emerged near the base, killed two soldiers and returned to Gaza with a captured Israeli soldier named Gilad Shalit. Hamas dedicated the operation to Jamal Abu Samhadana's memory. The exchange deal took place in 2011, and saw the release of 1,050

Palestinian prisoners, including Yahya Sinwar.

Blockade

Israel's evacuation of the settlements and military bases in Gaza was perceived by Palestinians as a victory for Hamas's path of armed resistance over that of collaboration and diplomatic negotiation championed by Fatah. Hamas won the January 2006 Palestinian parliamentary election and headed a National Unity Government with Fatah. In June 2007, when it seemed as if Fatah was preparing to use arms to remove Hamas from power, with Israel and US support, Hamas seized effective control of the Gaza Strip in a swift civil conflict. The occupied Palestinian territories were thereafter split into two hostile entities: the West Bank controlled by Fatah, and Gaza controlled by Hamas. In September 2007 the Israeli government announced a blockade of Gaza. The Israeli army started restricting food, diesel, electricity and humanitarian aid. They claimed to be calibrating the gradual privation to a level designed to turn the civilian population against Hamas but avoid a 'humanitarian crisis'.[84] Egypt under Mubarak, which was fighting its own internal struggle with the Muslim Brotherhood, enforced the blockade along the Egyptian border. The blockade was an unparalleled exercise in population control. Israel gradually increased the collective hardship through controlling the flow of essentials via checkpoints and terminals functioning as valves.[85] In 2007 a military document titled 'Food Consumption in the Gaza Strip – Red Lines' determined that an average of 2,279 daily calories per person was the minimum for survival.[86] The figure was adjusted for the entire population considering factors like age and gender, and translated into the number of trucks allowed in after deducting the perceived caloric value of agricultural production in Gaza. The total was broken down to tonnages of protein, carbohydrates and fats in the products allowed in.[87] The restrictions appeared random. Sometimes flour was allowed but yeast was prohibited, sugar was allowed but not coffee or tea. For two years hummus was

forbidden, then it was allowed but only the kind without tahini. Shampoo was allowed, but as Israeli journalist Amira Hass reported in May 2009 'one merchant discovered that the bottles of shampoo he had ordered were sent back because they included conditioner, which was not on the list'.[88] The gradual reduction of electricity from the Israeli grid devastated infrastructure systems, the economy and civil institutions. Cuts to the supply of diesel likewise reduced operation in the local power plant.[89] Electricity was available for only around half the day. Hospitals were incapacitated, and there was not enough power to contain all sewage from flowing untreated to the sea.[90] The shortage in medicines led to deaths from preventable diseases. The blockade was a slower way of continuous killing. Figures of 'indirect mortality' – avoidable death that is intentionally allowed – are difficult to establish. They are buried in comparative statistical calculations of mortality rates. Their relative invisibility might also explain why they have rarely been used in advocacy. Unemployment shot up to 43 per cent, 72 per cent of the population fell below the poverty line, 60 per cent suffered food insecurity, and more than 80 per cent became dependent on international welfare to meet basic needs.[91] Israel rewarded periods of calm by allowing provisions, and punished resistance by dialling the Palestinian economy down.

The Ministry of Underground Crossings

The siege turned the tunnels into a lifeline. At the end of January 2008 Hamas established project Salah al-Din, encouraging the excavation of new tunnels and making existing tunnels wider to increase the volume of trade.[92] Deprived of its ability to levy tax on commodities coming in overground through Israeli terminals, Hamas started taxing products coming in through the tunnels. The blockade was a 'blessing in disguise', said Mazen Abu Amarneh, a Hamas official in Rafah, 'it weaned us off of Israel and sixty years of aid'.[93] Hamas had also created a special tunnel-digging unit directly affiliated with al-Qassam Brigades.[94]

Unemployment meant skilled construction workers were available for the tunnel project and the subsoil became a giant construction site. Structural engineers and geologists designed entries and networks, building contractors facilitated the working schedules, builders took care of construction work, electrical engineers fitted the lighting and ventilation systems, traders arranged the flow of goods, clerks built the bureaucracy of taxation and the armed groups took care of security.[95]

More sophisticated excavation tools were brought in through the tunnels. A Palestinian report from 2014 estimates that there were 12,000 people working in the construction of, and trade through, the Rafah tunnels, with another 3,000 employed in related transportation and distribution.[96] The Indigenous knowledge that began with well digging, and the well-honed commercial sense of families who maintained old trading relations between Egypt and Palestine, evolved into a centrally regulated system. Rafah, a city of roughly 150,000, experienced a mini-boom, and unemployment fell to less than 20 per cent.

At the beginning of September 2008, the Hamas government set about formalising the smuggling economy through further regulation. The Rafah Municipality began collecting fees from tunnel owners in return for permission to dig, maintain and operate tunnels. It also charged tunnel operators with a one-time fee for connection to the electricity grid. The fire service was on standby for extinguishing fires in tunnels used to pump fuel. Customs officials weighed trucks and issued the tax vouchers necessary for permission to drive north of the Rafah area. In early 2009 the Ministry of the Interior in Gaza established the Tunnel Affairs Commission to act as the regulatory authority for commercial activities. It was colloquially referred to as 'the Ministry of Underground Crossings'. The ministry even introduced a planning system to prevent underground collisions. Underground traffic is similar to aerial traffic in that both start on the surface, move along different trajectories within a three-dimensional volume and end back at the surface. Collisions can bring down trajectories moving through both. Several hundred

tunnels were registered, but some, operated by local families, remained unregulated. It was now Hamas officials that started looking for hidden tunnel shafts. The ministry issued a list of banned imports including weapons (over which the armed groups sought exclusive control), alcohol, drugs and prostitutes. The ministry also introduced an equivalent to the visa system for Gazans seeking to travel abroad, with applications usually taking no more than a few days to process. Official overground visas through the Rafah Terminal took roughly two months and were often refused on security grounds, especially for men aged fifteen to forty. The tunnels operated around the clock, allowing political and military leaders, returning Palestinian academics, and even families on holiday to pass through.

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'Write your last will, you are facing the unknown, but it is the land you loved. Roll up your sleeves, and be a man. You are now twenty metres deep in the land of Gaza. Trust in God and complete your shift…twelve hours in hell, but remember there are hungry mouths waiting for you. Here death is merciful and quick…no pain no white phosphorus no Israeli soldier using you as a human shield, here there is no prison or jailer, here is God, the tunnel, the darkness, the slow breathing, and your little heart.' This anonymous testimony of a tunneller was collected by Palestinian scholars Sameer Abumdallal and Ghassan Abu Hatab of Birzeit University.[97]

Another anonymous Palestinian told an Al Jazeera journalist how he got to work in the tunnels. 'Through an intermediary, Hamas agreed to let us participate in digging tunnels, which pays really well compared to other works, because it is a secret job in which only trustworthy people are allowed to work'.[98] Diggers work long shifts. Some drilling rigs are activated by a bicycle chain, peddled by young men lying on their back. Some said that while they are inside the tunnel, they feel as if they are in a grave. Tunnel diggers work mostly on their knees. During work

hours they don't feel pain but after a few weeks it becomes unbearable. My friend Shawan Jabareen of Al-Haq told me that in the 1990s when he was held in Israeli administrative detention without trial, he heard that the painkiller tramadol, an addictive opiate, was first smuggled through the tunnels to Gaza to help tunnel diggers deal with pain. In the following decades the opiate spread across Gaza like an epidemic to the extent that the word became synonymous with being dazed.[99]

Tunnels can collapse because of Israeli bombing, manufacturing errors or heavy rains. Wet soil can short circuit exposed cables. A motor breakdown can unleash the pulleys. Ventilation outage can lead to suffocation. Hundreds of young lives were lost, some buried dozens of metres in the soil without the possibility of extraction. The family of the deceased, 'martyrs of preparation', received compensation.[100] In response to public concern at the rising toll of tunnel casualties, particularly of child workers, the ministry issued guidelines intended to improve safe working conditions, though these were unevenly enforced.

The First Tunnel War

On 4 November 2008, Israeli tanks and bulldozers crossed into the centre of Gaza Strip east of Deir al-Balah to destroy what they claimed was a tunnel shaft. The raid set in motion a process of cumulative escalation. Hamas responded with rocket salvos that reached, for the first time, Beersheba and Ashdod. On 27 December, the Israeli army unleashed an unprecedentedly destructive bombing campaign that was largely aimed, army spokespersons claimed, at tunnels. The bombing demolished thousands of residential buildings. On 3 January a ground invasion began. About one hundred armoured D9 bulldozers, some remotely controlled, drove in with the ground forces and systematically demolished buildings. The campaign lasted until 18 January. More than 1,400 Palestinians were killed; 25,000 buildings were destroyed or badly damaged.[101]

The tunnels in Rafah were damaged but quickly repaired.[102]

A US embassy cable from Tel Aviv, revealed by Wikileaks, reported that 'some tunnels continued to operate during the Israeli airstrikes, and…many others began operating again within days after the temporary cease-fire'.[103] A few weeks after the war, goods were already flowing back in from Egypt, as indicated by the receding of the temporary spike in the price of fuel and domestic goods. The UN estimated that, based on the amount of building materials allowed in by Israel, it would take decades to rebuild the homes destroyed or damaged and accommodate the growing population. Observers were however stunned at the speed of reconstruction. Gaza turned into a massive construction site with roadsides piled high with building materials brought in through the tunnels from Egypt.

In May 2010 Israeli soldiers attacked an international flotilla carrying humanitarian aid and construction materials in international waters, killing nine crew. International outrage and diplomatic pressure forced Israel to ease the siege and allow in more provisions and construction materials through the land terminals. Because Israel claimed concrete was used to reinforce the tunnels, Palestinian and international contractors had to submit detailed architectural plans from which quantities of building material were derived.[104] Every truckload of sand, gravel, iron and cement was monitored.

In September 2011 a World Bank report noted 'exceptionally high growth' of almost 30 per cent in Gaza's economy. All along the Philadelphi Corridor the border strip was filled with hundreds of tents and improvised structures, under each of which was a tunnel shaft. Some tunnel merchants operated a telephone order service, with some products arriving from Egypt in forty-eight hours. Muhammad Shehada, a Palestinian journalist who grew up in Gaza, remembered ordering KFC from al-Arish in Egyptian Sinai. An Egyptian taxi driver delivers it to a tunnel courier who ferries it across the border. The package is passed on to a Gazan taxi driver who delivers to the address. The meal, Shehada reported, arrived still warm, though 'biscuits, crisps, chocolate, twinkies were mashed & pulverised'.[105] The tunnel economy

prioritised items on Israel's banned list.[106] Livestock was brought in during holidays. Ponies, monkeys, crocodiles, hyenas, wolves, ostriches and chimpanzees were smuggled via the tunnels to the Gaza Zoo. A lion was brought in as a status symbol for a Gaza clan.[107] The World Bank estimated that 80 per cent of Gaza's imports came through the subsoil. This included household goods such as fridge freezers, washing machines, fuel-powered electric generators, ovens, TVs, computers, chocolate, Egyptian cigarettes, flour and rice, clothes and car parts.[108] Rickshaws, cars and even SUVs drove in through the widest tunnels. Fuel and diesel poured in through underground pipes. Rafah's markets were full of shoppers, ATMs distributed $100 bills, new restaurants and cafés opened and ran round the clock, attracting people from otherwise better off northern Gaza. A new class of tunnel millionaires built large villas complete with private security.[109] In 2010, Rifaat Salama, the city's police chief, told a reporter jokingly that they 'have run out of land for new tunnels'.[110] From the poorest city in the Strip, Rafah became the hub of the Palestinian economy in Gaza. The local municipality covered its debts, regularly paid the salaries of its employees and raised tax for the central Hamas government in Gaza. In December 2013 Alaa al-Rifaati, the minister of economy in Gaza, claimed the number of tunnels reached 1,400.[111]

Inevitably, however, the bubble burst. Construction of private, commercial tunnels was financed through shareholder investment. The share price, the number of partners, and the system for distributing profits were determined by semi-formalised agreements with 'tunnel brokers'. A bubble economy developed. Schemes offered unrealistically high rates of return. The investment was supposed to be returned from the fees collected from tunnel use, but was actually raised from the money paid by newer investors – a classic characteristic of a pyramid or Ponzi scheme. The bubble collapsed, and thousands of Gazans, from wealthier individuals to small-time investors, lost their savings.[112]

Egypt

The Arab Spring began in Tunisia on 17 December 2010, with the self-immolation of the street vendor Mohamed Bouazizi in the southern town of Sidi Bouzid. Ten days later protests reached the capital. Events across the region rolled at breakneck speed. By 6 January protests swept through Algeria. On 25 January 2011 crowds gathered in Cairo's Tahrir Square. On 11 February, Egyptian president Husni Mubarak was deposed. In July 2012, Mohamed Morsi, the leader of the Muslim Brotherhood, was elected president of Egypt. Morsi was an ally of Hamas and instructed the Egyptian army – which had anyway not made too big an effort in policing the tunnels in previous years – to support the tunnel trade to Gaza, which became legitimate, open and visible. The effects of the blockade were further eased. The general sense amongst jubilant Palestinians was that the isolation of the Strip was over. Posters of Morsi were put up in shops and cafes.[113]

Morsi's reign was however short-lived. In July 2013 he was overthrown in a coup led by the defence minister Abdel Fattah al-Sisi, who became president the following year. Following the coup, the Egyptian army ordered troops to conduct house to house searches and systematically destroy every house they found harbouring a tunnel. Exposed tunnels were flooded with seawater and sewage. In April 2014 the Egyptian army announced that it had destroyed 1,532 tunnels.

In October 2014 a Sinai-based militia killed thirty-three Egyptian security personnel. Al-Sisi claimed that Hamas supported these guerillas with weapons, refuge and training.[114] With US and Israeli encouragement, the Egyptian army stopped searching for tunnels, and started demolishing all 3,000 buildings within 500 metres of the border fence on the Egyptian side of the Philadelphi Corridor.[115] The Egyptian army claims they exposed 500 additional tunnels. During the following years Egypt gradually increased this buffer zone until it covered the entirety of Egyptian Rafah. The city was destroyed and 80,000 people

were displaced. The Egyptian government started constructing New Rafah City five kilometres away from the border.[116]

The tunnels in Rafah would never recover. A severe financial crisis followed and Gaza felt the full force of the blockade.[117] The smuggling economy across the border between Egypt and Palestine would resume a decade later, and when it did, it was not through the subsoil but through airspace. From the 2020s, and throughout the genocide in Gaza, hundreds of small quadcopter drones on preprogrammed routes carried goods and supplies from Egypt, mostly to the Palestinian communities in the Negev.

The Second Tunnel War

From the early 2010s photographs and videos from inside tunnels started to be frequently made public. Hamas and the Palestinian Islamic Jihad arranged carefully curated journalists' visits to some tunnels aiming to present their competence in digging them and to deter Israel from invading. The Israeli army, which had previously only released photographs and videos looking down tunnel shafts, had also started publishing videos of the interiors of the tunnels they exposed. Their aim was different, to justify invasion, aerial bombing and house demolition.[118]

All videos showed similar structures made of prefabricated concrete units for walls and arched ceilings. The passages were roughly 170 centimetres tall by 60 centimetres wide (in following years the typical cross section grew a little), spacious enough to walk single file.[119] Every few hundred metres the path changed direction. This was reminiscent of military trenches which zigzagged to break the shockwaves of explosions. Unlike in trenches, however, the tunnels' change of direction was made deliberately irregular to make their layout more difficult to predict.

On 8 July 2014 Hamas fighters detonated explosives in a tunnel under the Kerem Shalom military base south-east of Rafah.[120] On 17 July, thirteen al-Qassam fighters crossed the border

near the same point. The unit was attacked by Israeli drones but returned to Gaza unharmed. The army invaded Gaza with the stated aim of destroying cross-border tunnels. On 28 July Hamas fighters crossed under Gaza's perimeter fences near a small military outpost near kibbutz Nahal Oz, close to the same place where in April 1956 the Fedayeen had killed Ro'i Rothberg. In this area, the clay stratum rises from some twenty-five metres deep under Gaza City to the surface on the other side of Gaza's perimeter fences. Palestinian fighters raided the outpost, killed the soldiers inside, and returned to Gaza.[121]

During the subsequent ground invasion, the army claimed to have located and destroyed more than thirty cross-border tunnels.[122] At the time a ceasefire was agreed on Friday 1 August 2014, the army knew of one more tunnel going from Rafah towards the Envelope, but couldn't locate it. The ceasefire required all sides to hold to their positions, but Israeli units went on an armed patrol searching for the tunnel in an agricultural area of small fields and greenhouses. A short firefight ensued when the soldiers got close to a two-storey concrete-block structure. Several soldiers were killed, and an Israeli officer was captured and taken by an al-Qassam unit into the tunnel whose shaft was right under the structure.

The Israeli army issued the 'Hannibal' order. This directive is given when an Israeli soldier is captured by an irregular armed force, and instructs forces to stop the abduction by any means, even if they pose a risk to the captured Israeli (the Hannibal Directive is discussed at greater length in Part III). The army fired thousands of bombs, rockets and shells into the area of capture, a neighbourhood called al-Tanour. The bombardment caught thousands of civilians returning home in the belief that the ceasefire still held.[123] The massacre that ensued came to be known as Black Friday.[124]

Forensic Architecture, working with Amnesty International and Gaza-based human rights group Al Mezan, received thousands of photographs and videos taken by Palestinians in the areas, dashcam videos recorded from ambulances, hospital logs and

dozens of eyewitness testimonies to what took place. Located within a three-dimensional model of Rafah, this large multiplicity of media helped a team led by Christina Varvia from Forensic Architecture and Saleh Hijazi from Amnesty to construct the time-space puzzle that exposed the logic of the Hannibal Directive. We showed that the Israeli army bombed places they believed to be over the tunnel into which they knew their officer was taken, seeking to bury him and his captors underground.[125] The Hannibal Directive, we showed, was not an attempt to stop an abduction while 'accepting risk for the soldier', but a manhunt in which the Israeli army acted to kill one of its own before he could become an asset in a prisoner-exchange deal. The army failed in burying their officer in the soil, but their bombing killed 135 Palestinians living above the surface.[126] Our report was submitted to the International Criminal Court where a day-long session with the prosecution's investigative team was arranged in early 2016. Six months later, the Israeli army announced it had cancelled the Hannibal Directive.[127] This might have been a legally pre-emptive move, but the Hannibal Directive did not disappear, staging a devastating return on 7 October 2023.

Sand and Concrete

In the wake of the 2014 tunnel war, with close to 100,000 destroyed and damaged buildings, Gaza once more turned into a construction site, financed through international aid, with Qatar the largest donor.

It was under the veil of reconstruction that the tunnel project could be further expanded. For tunnels to be dug, a substantial amount of soil, equal to the volume of the cavity, needs to be extracted without its disposal becoming visible to Israel's optical surveillance from above.[128] The problem was captured by a document published by al-Qassam after the war. It proposes an illustration of the risk of the tunnel being exposed – 'even with the last hit of the pickaxe or bucket of sand' – in the form of a calculation. 'For the brothers to dig out a tunnel [the document

refers to a tunnel 600 metres long] they extract approximately 600 cubic metres of sand which need to be disposed of by 120 truck runs.' The smallest cross section of a tunnel 170 cm tall by 60 cm wide is one square metre. Every metre of tunnel thus requires the extraction of roughly a cubic metre of soil. Every five metres length of a tunnel requires, the document explains, a truck journey.[129] So 500 kilometres of tunnels (Israel's own estimation before 2023) would require the disposal of 500,000 cubic metres of soil, or 100,000 truck runs. How to hide such a movement? And where should all this soil go?

Much of the soil removed from tunnelling is sand. Construction sites provide an opportunity to recycle it. Sand constitutes roughly three-quarters of the dry volume of the mixture that goes into concrete – the rest is gravel, at roughly 15 per cent, and cement at 10 per cent. 'Sand has been to cities what flour is to bread,' writes journalist Vince Beiser.[130] Concrete buildings are mostly made of sand. Concrete makes up the bulk of the built environment, certainly in Gaza, which thus, like many places worldwide, is a city mostly built of sand.

Marine sand, of the kind found on Gaza's shores or in its subsoil, is not ideal for construction. The water rounds its edges, a fact that reduces its binding strength. Such sand also contains a high proportion of salt which can speed up the erosion of internal iron reinforcement bars. But since Israel restricted the amount of sand entering Gaza through the terminals, local sand had to do. Salt can be washed off and the binding strength is improved by adding crushed rubble from bombed buildings. Due to ongoing Israeli bombardment, there was no shortage of this type of raw material to repurpose. The subterranean sand and crushed rubble were thus absorbed into construction sites. A shaft under a building provided some of the material volume that went into the walls, floors and roofs. It is tempting to imagine that the negative volume of the subterranean cavities of the tunnels is related to the built-up volume above ground.

The Laboratory

There were four jars reportedly sitting on the shelf behind the commander of the Technological Laboratory for Locating Tunnels – the Israeli military intelligence unit tasked with searching for tunnels – each one containing a different type of soil: yellow-ochre sand, lime-bleached sandstone, the greyish loess and red-brown clay. The laboratory – housed in trailers in the Gaza Division headquarters in kibbutz Re'im – began operation in early 2016. Its members include geologists, geo-engineers, physicists, mathematicians and intelligence personnel. Its establishment was, according to the army, one of the lessons drawn from the army's inability to find the last tunnel during its 2014 incursion. Their task, in the words of one of its officers, is 'to crack the tunnel code'. 'What finds the next tunnel,' he continued, 'is the one previously discovered.'[131] Each exposed tunnel potentially sheds light on the overall logic and the location and direction of unknown ones. Each of the laboratory members is referred to as a 'decoder' and is expected to combine analysis from three sources – electronic interception, geological survey and human intelligence. The commanding officer likened their task to 'playing a chess game against Hamas'.[132]

Most information that exposes tunnels comes from espionage. The Shin Bet, Israel's notorious general security agency, recruits and operates informers from within humanitarian organisations, mosques and hospitals. However, recruiting and meeting agents was difficult for the Israeli army in Gaza, where Hamas runs an effective counter-espionage operation.

Unit 8200 of the army's intelligence corps leads the task of electronic surveillance – signal interception of mobile phones and computers. It is not only the contents of the messages that is important for the decoders but the location of the phone. Even the place where mobile phones are switched off and where they lose signal can reveal the location of a tunnel. Careless operatives keeping their phone on can reveal the location of a shaft as the phone will lose reception a few metres under.

Aerial reconnaissance is often tasked with identifying military objects in images. But tunnels are invisible and thus the task of this type of reconnaissance is to study telltale signs in the transformation of a slice of territory over time. What can be identified is not the tunnels but rather attempts to hide them. Such attempts are not visible in single images but in the relation between them. A sequence of such signs might run like this: a tent appears in an orchard (to cover a place of excavation), later images show that it has been replaced by a shed, lighter patches (of excavated soil) appear nearby, pickups are seen parked often in the area, the shed is replaced by a small concrete structure, and so on. The search for similar patterns of transformation is then automated, computed via algorithms or via the use of AI.[133] Between known or assumed tunnel shafts the computerised system proposes multiple possible routes.[134] The search is, in the words of the laboratory officer, 'a three-dimensional puzzle'.[135] In order for the full extent of a tunnel not to be completely exposed when a shaft is revealed, tunnel diggers do not follow a single, simple design principle. Random changes in the direction of the tunnel are introduced in an effort to mislead the investigators, human or computerised.

When the army is on the ground, it uses ground-penetrating technologies based on the transmission into the subsoil of different types of waves – electromagnetic, radio or acoustic. While shallow tunnels can be detected by ground-penetrating radar, detection gets progressively more difficult the deeper the tunnel. Twenty metres under and the image starts to blur. Tunnels deeper than forty metres are largely undetectable.

A digital mapping system known as the 'Alchemist' was developed by the intelligence corps Unit 9900. It operates like a military version of Waze or Google maps. Each building in Gaza receives a unique identification number and can be presented as a three-dimensional model. Structures in which an armed Palestinian unit or a tunnel shaft are suspected to be are highlighted orange or flashing red. When a building is demolished, its removal is immediately updated on everyone's

screens.[136] This mapping system – above and below ground – was one of the technical inventions that became operative in 2021, during the tenure of Aviv Kochavi as commander of the army. It was a central component in what he called a 'multidimensional operational doctrine' which included new methods of fighting in the tunnels.

The System

The nature and extent of Hamas's tunnels is the subject of speculations, exaggerations, propaganda and disinformation. True information is kept secret. In regard to the length of the tunnels the descriptions made by all sides converge. In 2016, Ismail Haniyeh, then Hamas leader in Gaza, said the tunnel network extended to some 400–500 kilometres.[137] In 2023 Israel estimated their extent at 500 kilometres and in 2024 revised it to more than 700 kilometres.[138]

In 2021 Israel started to refer to the tunnel networks as the 'Metro', alluding to a single integrated system. Palestinians called them 'spiderweb networks', referring rather to their multiplicity.[139] Hamas, the PIJ and large families each operated a different tunnel network. Even within a single organisation the systems are compartmentalised.

In 2021 the army released a map purporting to expose the layout of Hamas tunnels. It showed eight interlinked matrices, each extending under the entire extent of a different city, part thereof, or a refugee camp. The army claimed that each system was run by another of al-Qassam's regional battalions. From above, each system had the layout of a strange hieroglyph. Radiating out of a few nodal points each had a dozen or so arms, zigzagging in irregularly sharp angles.[140] The eight systems were connected to each other underground. The army claimed that each of these tunnel systems integrated all the tunnels' different functions. Shallow tunnels allowing for tactical movement across the city were linked to deeper ones providing shelter, and from there to even deeper tunnels where command

and control centres were located. These in turn were connected to subterranean weapons manufacturing and storage facilities, which were themselves linked, through underground supply lines, to rocket launch shafts in the coastal west and to attack tunnels running under Israel's fences to the Envelope in the east. According to an Israeli geologist who worked with the army the three main layers of tunnels were within the three layers of clay. With enough food, water and air, Hamas operatives could stay within this 'parallel world', the army believed, for months.[141]

However, nothing like a single metro in which every entry shaft is connected to all others can ever exist. If the tunnel system was wholly integrated, the full extent of the metro would be exposed with the first shaft, or the entire system could be gassed from one point (Israeli forces did use toxic gas to kill people in tunnels, as we will see in Part III).

Rather than a designed system, let alone an integrated one, tunnels are rather an operative principle, and the layout is the result of the interaction between multiple actors in a decentralised system. No single map exists as it could fall into Israel's hands. Because the production of tunnels requires only rudimentary means – connections are achieved with spades, buckets and human labour – each tunnel system could continuously evolve and grow in response to needs, rather than to a predetermined design. Despite Israel's claim that many or even all school buildings, universities and mosques harbour tunnel shafts, highly frequented public buildings are better avoided because they are more vulnerable to informers.

Videos released by the Israeli army of the detonation of tunnels between October 2023 and 2025 show the exploded route through thermal images. In these videos tunnels seem to be a multiplicity of critical local bypasses within or between neighbourhoods, running across major roads, short-circuiting the logic of movement through the city. Tunnels are continuous with the surface rather than a separate and parallel domain to it. When a tunnel resurfaces, concealed movement, so al-Qassam videos show, continues across the built fabric through holes in party

walls, within workshops, garages or under covered walkways. The description of a parallel world inhabited by a complete metro system coextensive with the Gaza Strip, is propaganda meant to justify the total destruction of the surface.

The Third Tunnel War

In 2017 Israel began the construction of a new fencing system six to eight metres high around the entire perimeter of the Strip. Under it ran an underground barrier of undisclosed depth. The barrier system – named 'Sand Clock' – was equipped with geophones, underground acoustic sensors able to detect the sound of tunnel digging and even movement in existing tunnels. The barrier became operative in 2021. It was one of the largest engineering projects in Israeli history.[142]

In May 2021 protests erupted over the eviction of Palestinian families from their homes in the Jerusalem neighbourhood of Sheikh Jarrah, near the Old City, and police raids on the al-Aqsa compound.[143] Hamas launched rockets from the Gaza Strip and Israel began a massive campaign of airstrikes, concentrating on the tunnel network and subterranean rocket launch sites. The Tunnel War of 2021 extended between 10–21 May. Palestinians referred to it as the Unity Intifada because it ignited protests not only in Palestinian cities in occupied Gaza and the West Bank but also amongst the Palestinian communities in Jaffa and al-Lydd.

The flare-up provided Aviv Kochavi with what he perceived to be an 'opportunity to turn the tunnels from a strategic asset to a trap'. With the tunnels 'Hamas thought they had cracked something big, that they had found an answer to our superiority in the air, in intelligence and in manoeuvring,' he explained. 'We will hit Hamas with a reality-transforming strike, that if successful, will de-territorialise it – deny it a territory from which it can act.'[144] The subsoil under Gaza was the only part of Palestine over which Israel had no control and with this action it sought to establish it. On 13 May, Kochavi gave the go-ahead to implement his plan, some years in the making. The army

estimated that the attack could bury between 600–1,000 fighters, including senior officers, perhaps even Hamas military chief Mohammed Deif himself.

The first step was to lure Hamas fighters underground. Armoured regiments were moved close to the Gaza fences, signalling they were about to invade. Shortly after midnight on 14 May 2021, a military spokesperson told foreign reporters, falsely, that a ground invasion had begun. The aim was to make Hamas fighters take up their battle positions within the tunnels. At the same time, more than a hundred jets were deployed at high altitude. When the signal was given they dropped some 450 'bunker-buster' bombs almost simultaneously on all exits of the tunnel network under Gaza City. The bombs hit the ground at close to the speed of sound, and continued down to thirty metres before detonating. Palestinians said it felt like an earthquake. Buildings collapsed on their occupants. Prime Minister Benjamin Netanyahu said that 'The Hamas Metro has turned from a strategic asset into a death trap.' Defence minister Benny Gantz said that the tunnels turned into 'mass cemeteries'. The 'Metro of Hamas', he said, became a 'train to hell'. The Israeli press hailed the operation as a masterstroke and Kochavi as a 'genius' – 'the best warlord the Jewish people had had since [Simon] Bar Kokhba' led the rebellion against the Roman Empire. The army was euphoric: 'We killed the engineers and developers, we killed their replacements and we killed the replacements of the replacements.'[145] It wasn't until August 2021, three months after the bombardment, that the army finally admitted that Kochavi's plan had failed. Israel might have not had a correct map of the subsoil after all, or Hamas had seen through the deception and hadn't ordered its fighters into the tunnels. There was only a handful of casualties underground; above ground more than 120 people perished.

Kochavi and I have history. Almost twenty years ago, I wrote about a raid he led in April 2002, while commander of the paratroopers brigade, into the city of Nablus and the Balata refugee camp on its eastern outskirts. I was interested in the way

this raid unfolded in relation to theories promoted by a group in the army known as the Operational Theory Research Institute. They discussed urban warfare using terms from philosophy and critical theory, and purported to apply concepts associated with canonical works of theory on resistance to state and colonial power such as Gilles Deleuze's and Félix Guattari's *A Thousand Plateaus*. They referred to 'smooth space' to describe a kind of borderless area unhindered by divisions and barriers, and the 'swarm' as a simultaneous multiplicity of coordinated attacks. They have used the concept of *dérive* – 'drift' – developed by Guy Debord, the Marxist prophet of the Situationist International, describing a way of moving through and across the city as if it was a borderless place. They also used a hodgepodge of contemporary writings of post-colonial, urban and architectural studies. Kochavi was part of this group. He had studied philosophy at university, though he claimed that he had considered architecture.

When the Hebrew-language journal *Theory and Criticism* – one of the few Hebrew-language academic platforms that allowed, in those days, anti-Zionist texts – asked to publish my essay, the editor, without my knowledge, sent a copy to Kochavi asking for a response. The response was a letter from Kochavi's lawyers threatening libel action. I saw this as an opportunity. If the case went to court, I would be able to bring attention to Kochavi's actions and hopefully cross-interrogate him. But the journal wouldn't take the risk. The editors asked me to alter the text; I refused and pulled the piece. Others did the same in solidarity.[146] What Kochavi's lawyers couldn't contest were his own words. The article was based on a filmed interview I had initiated with him, in which he described the raid on Palestinian refugee camps as 'inverse geometry'. His soldiers went from one building to the next by punching holes through party walls and moved across the old city of Nablus and the nearby Balata refugee camp along hundreds of metres of 'overground tunnels' carved out of the continuous urban fabric, without ever setting foot in the streets or alleys. They killed seventy Palestinians.[147] In the interview

Kochavi described the theory behind his raid in quite astounding language: ‘This space that you look at, this room that you look at, is nothing but your interpretation. Now, you can stretch the boundaries of your interpretation, but not in an unlimited fashion – after all, it must be bound by physics, as it contains buildings and alleys. The question is, how do you interpret the alley? Do you interpret it as a place, like every architect and every town planner does, to walk through, or do you interpret it as a place forbidden to walk through?’ He went on to explain that this is the reason ‘we opted for the method of walking through walls…Like a worm that eats its way forward, emerging at points and then disappearing…We took this micro-tactical practice and turned it into a method, and thanks to this method, we were able to interpret the whole space differently.’[148]

A Palestinian woman who identified herself only as Aisha described the experience of such a raid:

> Imagine it – you’re sitting in your living room that you know so well, this is the room where the family watches TV together after the evening meal…And, suddenly, that wall disappears with a deafening roar, the room fills with dust and debris and through the wall pours one soldier after the other, screaming orders. You have no idea if they’re after you, if they’ve come to take over your home, or if your house just lies on their route to somewhere else. The children are screaming, panicking…Is it possible to even begin to imagine the horror experienced by a five-year-old child as four, six, eight, twelve soldiers, their faces painted black, sub-machine guns pointed everywhere, antennas protruding from their backpacks, making them look like giant alien bugs, blast their way through that wall?

Aisha pointed to another wall in her home with a built-in bookcase: ‘And this is where they left. They blew up the wall and continued to our neighbour’s house.’[149] A survey conducted by the Palestinian architect Nurhan Abujidi showed that more than half the buildings in Nablus’s casbah had holes punched through them. Israel’s techniques of urban warfare aren’t particularly

novel. The defenders of the Paris Commune, much like those of the casbahs of Algiers, Beirut, Nablus, Jenin, Jabalia and, as we have seen, Muhammad al-Aswad's Shati refugee camp in the 1970s: these fighters navigated the city in small, loosely coordinated groups, moving through openings and tunnels between homes, basements and courtyards, using secret passageways and trapdoors. The complete absurdity is the army's brazen appropriation of a philosophy of liberation – and of revolutionary and anti-colonial praxis – to perform the task of brutal state repression of an occupied people. It was the defenders of Gaza who used the subsoil to keep old trade routes between Egypt and Palestine open and alleviate conditions of life imposed on them by those that sought to expel them from this land, or to attack from below and disappear; it was they who gnawed like worms the earth from inside. While the Israeli army was talking about Deleuze, Debord, 'multidimensional warfare' and 'walking through the walls', Palestinians reinvented and transformed the entire geometric order of space. Trying to 'crack the code' of the Metro, obsessed with its own mapping, multidimensional warfare and AI, the army could not fathom the 'swarming attack' that was to take place on 7 October 2023.

Part III

Ungrounding

The ruins of a home in Gaza City. The graffiti reads ‘Omar and Usama are under the Rubble’. Destroyed buildings have turned into cemeteries. At the time of writing, there are an estimated 11,000 Palestinians missing in craters and under rubble. @RamAbdu, 24 November 2024.

6:29

Over the generations the plough line, carved in 1950 into the landscape around what came to be known as the Gaza Strip, thickened into a deep fortified frontier meant to keep Palestinians hemmed in and deny their return. As we saw in Part I, the first line of fortification to be put around Gaza were agrarian settlements, a 'living wall' that functioned as a line of defence. Within and between the settlements were military bases connected by a matrix of roads. Between the line of settlements and the Strip were large fields, creating an open plain of visibility. In Part II we saw that it was only after the Gaza Strip was occupied in 1967 that the Strip was first surrounded by fences built over the plough line. Over the decades more layers of fences were added parallel to this line. Behind the fences the army piled a landscape of earth mounds, creating ramps for tanks and high positions for its snipers. Further behind these were cylindrical concrete control towers crowned with remotely operated machine guns and surveillance equipment, security cameras and radars. At the interface between the Envelope and the Strip were several fortified terminals at which internationals and the very few Palestinians that were allowed in or out could enter or exit, channelled through caged corridors. On the Gaza side, Israel declared a buffer zone a few hundred metres wide where every building was flattened by bulldozers and many plants were killed by herbicide sprayed from the air. Thousands of Palestinians entering this buffer zone were shot by snipers. From the sea Gaza was hemmed in and policed by the Israeli navy. The Strip's short southern border in Rafah was sealed by the Egyptian army which in the last decade destroyed the entire Egyptian part of the city. The Envelope has also become multidimensional. The fences included a deep underground barrier with sensors to detect subterranean activity, designed to block cross-border tunnels. Drones, military planes and surveillance balloons were constantly

hovering above. The volumetric three-dimensional enclosure was completed by the 'Iron Dome' missile interceptor system. These elements were combined by the Israeli army's Gaza Division – located where the two main tributaries of Wadi Gaza join into its main stream – into an integrated system of total enclosure, the most fortified border anywhere in the world. It was through this system of enclosure that Israel exercised an almost two-decades-long blockade. It was because the Envelope exercised such control over life in Gaza that Gaza was considered an 'occupied territory'. [1] The enclosure seemed hermetic and the army believed it had solved the Gaza problem.

The attack on the Envelope began at 6.29 a.m. on 7 October 2023 with a barrage of thousands of rockets that saturated Israeli radar space. The sound of sirens, rocket landings and mid-air explosions of Iron Dome interceptors sent Israeli soldiers to their shelters rather than to their battle positions. The elite Nukhba units of theQassam Brigades used dozens of quadcopter drones attached with improvised grenade launchers – which made their first appearance on the battlefields of Ukraine – to deactivate some of the Israeli army's communication antennas. Palestinian snipers shot down an observation balloon (three others had been grounded for repairs). They also shot at the radar dishes and the cameras placed on top of the concrete towers surveilling the Strip. Without their cameras to see the waves of Hamas fighters, several hundred at a time, that charged towards the fences, the remote-controlled guns could not shoot at them. With their communication towers deactivated, the command centre of the Gaza Division could not obtain a precise image of what was taking place and coordinate their troops. Hamas fighters blew open more than sixty breaches in the fences. A video of a tractor widening the gaps so that vehicles could drive out went viral. Waves of fighters attacked each of the elements that composed Israel's matrix of fortifications. They stormed the border terminal of Erez, named after kibbutz Erez, next to which it is located, occupied it and smashed through the hated remotely controlled turnstiles and the biometric scanners. Other fighters broke into

the headquarters of the Gaza Division that is close to the kibbutz settlement of Re'im. Knowing exactly where to go from intelligence gathered on soldiers' social media and online satellite images, they deactivated the command and communication centre that coordinated all units along the frontier. They also overran a number of other military bases in or near settlements, such as the concrete fortress near to kibbutz Nahal Oz, and put under siege the secure rooms into which soldiers retreated. The army became blind and mute and lost control of the situation. Palestinian fighters took control of strategic road intersections to block the arrival of reinforcements. The Envelope's system of fortification was designed to deal with isolated, local incursions. A breach in one place would see the network closing in on it. However, with all the interdependent elements in the network targeted simultaneously by a multiplicity of small forces, the system imploded.

The failure of the Israeli army was at its base conceptual. It could not fathom a level of sophisticated coordination by Palestinian fighters it denigrated, following colonial tropes, as 'gunmen in flip-flops'. The army imagined any attack would come via the tunnels. Attacking overground gave Hamas the element of surprise, allowed it to use much larger force, along a wide front, simultaneously and in large numbers.

Peeling back the Envelope layer by layer, Hamas fighters seemed to reverse the material history of the frontier. The video of the bulldozer widening the opening of the fence was taken in front of the kibbutz settlements of Nirim and Nir Oz built on lands that belong to Ma'in Abu Sitta. It took their units no more than a few minutes to cross the few kilometres of fields between the fences and the settlements. The first to be breached at 6.49 a.m. was kibbutz Nir Oz. This kibbutz settlement would be occupied for almost half a day, and the Israeli army estimated that some 500 Palestinian fighters and civilians were in it at one point or another. Forty-seven people were killed, the highest number of any settlement along the frontier, and seventy-six were taken hostage. Throughout the day, Palestinian fighters broke into

twenty other settlements that surrounded the Strip. For the first time since 1948, Palestinian fighters occupied towns and villages in Palestine.

By placing its civilian settlements in the front line as part of the enclosure of Gaza, with some of the military bases in or close to them, Israel blurred the distinction between civilians and the army. On 7 October this blurring was fatal. The civilians in the settlements got the worst of both worlds. They were unable to defend themselves as soldiers, and their inhabitants were not spared as unarmed civilians should be when occupied by armed forces. After the first wave broke through, Hamas encouraged other Palestinian armed groups and civilians to follow. Many took the opportunity to exit Gaza for the first time. On foot, or by bikes or horses, they entered the lands from which their parents and grandparents had been displaced.

On 21 January 2024, more than three months after the attack, Hamas released an eighteen-page text in English titled 'Our Narrative' aiming to explain the reasons for undertaking 'Operation al-Aqsa Flood' on 7 October and the high number of Israeli civilians killed. It claimed that the attack 'focused on destroying the Israeli army's Gaza Division' and that avoiding causing 'harm to civilians, especially children, women and elderly people is a religious and moral commitment'. The document concedes that there may have been 'some faults' in the operation and that their fighters killed civilians 'accidentally' in the confusion caused 'due to the rapid collapse of the Israeli security and military system'.[2] However, the videos broadcast from the body cameras of Hamas fighters themselves – as well as videos taken by the settlements' CCTV systems and on survivors' mobile phones – show Palestinian fighters shooting unarmed civilians trying to flee, tossing grenades into security rooms where civilians sheltered, and torching homes with families inside. Care workers from the Philippines, agricultural workers from Nepal and Thailand as well as Palestinian workers present in the settlements were shot. Videos show the violent abduction of men, women, children, and even instances where babies and the elderly were

captured by different Palestinian factions.

Yocheved Lifshitz, the eighty-five-year-old from Nir Oz, was one of the Israeli civilians abducted into Gaza, alongside her husband, Oded, a journalist. When she was released, after two weeks in captivity (she said she was treated well by her captors, but Israeli TV studio experts arrogantly dismissed it as Stockholm Syndrome), she said she was captured at her home, laid across a motorbike and taken to Khan Younis through the breach in the fence. There she was brought into a tunnel. 'We went underground and walked for kilometres in wet tunnels, for two or three hours, in a spider's web of tunnels…until we reached a large hall.'[3] The tunnels may have not been used in the attack but were instrumental to the retreat.

An outdoor music festival whose organisers had chosen a location three kilometres from the fences of a place afflicted with such cruelty was also targeted after the party was spotted by al-Qassam fighters that morning. The Nova festival took place in a woodland, next to a bridge where Road 232 – the main artery stringing together the Envelope's front-line military bases and kibbutz settlements – crossed Wadi Gaza, and not far from the Gaza Division headquarters. The body cameras on Hamas fighters recorded them shooting at the doors of toilets in which people hid, at people in panic trying to escape the scene, running or by car. Videos of the aftermath show dead bodies of partygoers on the dance floor, behind the bar, amongst the trees of a small orchard where they hid. Some of the survivors tried to escape by sliding down the sharp edges of Wadi Gaza and hid within the same kind of side-growth that in 1948, all along Wadi Gaza tributaries, offered protection to Palestinians, like the Abu Sitta family, who hid from the Israeli forces that came to destroy their villages and expel them. An Israeli woman was reportedly discovered hiding in the stream several days after 7 October.[4] The people killed at the Nova festival accounted for almost half the total civilian casualties.[5]

Not all killings were performed by Hamas fighters. Some were undertaken by Palestinian fighters from other armed groups,

others by the armed civilians who followed them. Importantly not all Israeli casualties were killed by Palestinians. Seventy-seven burnt-out vehicles were left scattered across the fields that separate the front-line settlements and the torn fences around the Strip. Within and beside the vehicles were hundreds of mangled bodies of Palestinian fighters and Israeli civilians. It was hard to tell the remains apart and many Palestinians were initially added to the list of Israelis killed that day. They were shot and shelled by Israeli combat helicopters, drones and tanks ordered to stop Palestinian attempts to return to Gaza with captives 'at all costs'. Pilots understood what the air force headquarters' command – 'no single vehicle can return to Gaza' – meant in practice and fired at vehicles carrying Israelis into Gaza.[6] The open fields between the settlements and the Gaza perimeter fence were the first buffer zone put in place between Egyptian and Israeli front lines in the armistice agreement in February 1949. As noted in Part I, this buffer zone, like all other buffer zones that were and would be established by Israel within the Strip, was considered an open-fire area, a kill zone where any Palestinian entering, armed or not, was shot. On 7 October 2023, the site of the first buffer zone became also a kill zone for captured Israeli civilians shot by the Israeli army.

The Israeli army's use of overwhelming force to target Israeli captives and hostages marked the return of the Hannibal Directive, a controversial order that was put into practice in 1986 and was supposedly revoked thirty years later in 2016, after its bloodiest enactment on 1 August 2014.[7] As mentioned earlier the directive was understood by soldiers to be a command to kill their captured comrades before they became prisoners. On 7 October 2023 it seems to have been applied throughout the entire Envelope and extended to include civilian hostages. A tank commander opened fire on two Toyota pickups loaded with hostages exiting Nir Oz towards Gaza. 'I decided that this is the right decision. I prefer stopping the abduction so they won't be taken.'[8] One of the fighter helicopter pilots described his attempt at targeting all vehicles that crossed the fields towards

the Strip as a ‘mass Hannibal’ event.[9] In the kibbutz settlement of Be’eri an Israeli tank fired at a family home occupied by al-Qassam fighters, killing thirteen hostages. Many of the civilians and soldiers killed during the day were killed by these acts of Hannibalisation.

Israel’s official death count has a total of 1,139 people – Israeli civilians, thirty-six children included, foreign workers, soldiers in uniform or on leave, armed guards, and police officers – and 253 people taken into Gaza, the soldiers as captives, the civilians as hostages. Without Israeli troops enacting the Hannibal Directive, potentially hundreds on the list of the dead could have been added to those captured.

Almost immediately Israel and its supporters started exaggerating what needed no exaggeration. There was no evidence to the claim, repeated by Netanyahu, that babies were beheaded or put in ovens. Things were shocking and humiliating enough for Israel. Atrocities were committed, but this was not a situation akin to the Holocaust, as the Israeli ambassador wearing the yellow star at the UN General Assembly suggested. This reference created a situation in which the Palestinian population itself was cast as Nazis, and an existential threat to Israel.

By the late afternoon of 7 October the army gained control of most of the area, though isolated pockets of Palestinian fighters held for longer. The Envelope was in ruins. Satellite images showed plumes of smoke rising from settlements, military bases and fields. The remaining settlers were evacuated. The breach lasted roughly one day but its implications will continue to reverberate throughout the region and the world for decades. The Envelope had been declared a closed military zone and turned into a logistical centre for the most horrific of campaigns.

On the morning of 8 October, Rushdi al-Sarraj, the director of Ain Media, Forensic Architecture’s close partner organisation in Gaza, reached out to Shourideh of Forensic Architecture.[10] Rushdi was abroad and trying to return to Gaza to document events as his organisation has done for years. Ain Media was founded in 2008 by two film-makers and journalists, Rushdi and

his friend Yasser Murtaja – the latter was killed by Israeli sniper fire in April 2018; it produces journalism and long-form films 'to speak the truth from Gaza with no fear'.[11] We had worked together for almost a decade. After he returned, Rushdi asked us to help find out what had happened to three of his colleagues whom we knew from common projects – cameramen Ibrahim Mohammad Lafi, Nidal al-Wahidi and Haitham Abdel-Wahed. He had lost contact with them on 7 October while they were filming on the Palestinian side of Erez Crossing, which had been taken over by Hamas fighters in the early hours. All three wore PRESS vests and held cameras. The body of Lafi was the only one to be found. While Ain Media colleagues were searching for them on the ground, we were searching for them in images and videos appearing online and those sent to us. We established their location amongst a group of people moving along the caged corridor leading to the terminal. Synchronising different videos, we were able to establish the time. A satellite passed over the area afterwards. In it we saw the crater of a large bomb right in the middle of the corridor along which the crowd was moving. But the crater had not yet formed when we saw the journalists walking towards the place where the bomb was soon to land. Space and time were closing in on our colleagues, but there was still a chance that they had managed to pass the area where the bomb was to fall. We left the result open. Al-Wahidi and Abdel-Wahed are still missing, along with more than 11,000 other Palestinians. Since 7 October 2023 at least 235 journalists and media workers have been killed by Israel across the Gaza Strip.[12]

Exchange Rate

There were a number of triggers to the Hamas-led attack on 7 October. The Israeli government was in the process of changing the status quo in al-Aqsa Mosque – a standing practice going back to 1967 by which the Jerusalem Islamic Waqf administered the site, and non-Muslims could visit but not pray. The extreme-right minister of internal security, Itamar Ben-Gvir, led provocative

visits and prayers with his supporters. At the same time there was an intensification of the army and settlers' pogrom-style attacks in the West Bank. Israeli mobs, with army support, raided, killing and burning homes and vehicles in Palestinian towns and villages. Hamas also wanted to break Israel's sense that it could enjoy security while keeping a people under permanent occupation and siege, and realised that now was the moment, with the government distracted by the widespread discontent within Israeli society over the Israeli government's attempt to weaken legal review of its executive action. The attack aimed to ignite a rebellion across Palestine, potentially with Hezbollah and Iran joining in.

Operationally, Hamas's core objective was to take hostages. The capture of Israelis has a prominent place in the history of the Palestinian armed struggle. It is a means of forcing Israel into negotiations and by extension releasing Palestinian prisoners. Israel refuses to recognise Palestinian fighters as combatants and does not grant them prisoner-of-war status in line with the Geneva Convention. Since 1967, Israel has imprisoned over 800,000 Palestinians from the West Bank and Gaza, accounting for about 20 per cent of the total population and about 40 per cent of all Palestinian men.[13] Israel's mass incarceration and its extensive use of administrative detention without trial means that many prisoners have few alternative routes to freedom. These prisoners are rightly considered by Palestinians to be hostages.

Throughout the history of prisoner-exchange deals, an exchange rate has been gradually established. In July 1968 the PFLP hijacked an El-Al flight and landed it in Algeria. It was the first in a series of hijackings whose stated aim was the release of Palestinian prisoners, and led to twenty-two Israeli hostages being exchanged for sixteen Palestinian prisoners. The Israeli government denied that there had been a deal. Such an exchange rate would not hold for long. Palestinian intellectual, writer and PFLP leader Ghassan Kanafani said, 'We don't hijack planes because we love Boeing 707s. We do it for specific reasons.'[14]

Whereas it was primarily civilians who were captured in the

infamous hijackings of the 1960s and 1970s, from the start of the 1982 Israeli invasion of Lebanon, soldiers were closer at hand and could be captured on the battlefield. In September 1982, after Israel's invasion of Lebanon, Ahmed Jibril's splinter group from the PFLP, the PFLP General Command, captured three Israeli soldiers. Three years later, in 1985, in what was known as the Jibril Deal, the prisoner swap occurred at a much higher exchange rate: three Israeli soldiers for 1,150 Palestinian prisoners. The prisoners included Ahmed Yassin, the cleric who founded Hamas in 1987. Many of those released would later be assassinated, as Yassin was in 2004. There were other exchanges in the years that followed, notably the 2011 deal to release Gilad Shalit, the Israeli soldier captured by Hamas in 2006.[15] Amongst the 1,027 prisoners released was, as mentioned in Part II, Yahya Sinwar. No doubt Sinwar was committed to free Palestinian prisoners left in Israeli hands. Whenever an exchange deal was on the horizon, the Israeli right and the national-religious settler movement were consistently the most adamant opponents. They saw the public campaigns for the release of Israeli hostages as proof of the weakness of secular Israeli society.[16] Immediately after 7 October 2023 the nationalist-religious settler movement objected to any prisoner exchange deal with Hamas. On the 9th and again on 15 October 2023, Hamas offered to release all civilian hostages in exchange for the Israeli military ceasing its bombing of the Strip and not entering Gaza. The Israeli government rejected both proposals.[17] The terms remained more or less the same throughout the following two years: an exchange of hostages and a permanent ceasefire.

Unable to deter the capture of soldiers or civilians or lower the exchange rate in prisoner deals, decades earlier the army had already announced that the capturing of Israelis would result in it destroying the cities of the captors. The model was the 2006 war with Hezbollah, after the latter's fighters captured two Israeli soldiers in a cross-border raid. Israel launched what was then its biggest bombing campaign, killing close to 1,200 people, displacing a million and damaging more than 100,000 homes,

public infrastructure, schools and hospitals as well as the international airport.[18] The south Beirut suburb of Dahiya, a stronghold of Hezbollah, was in ruins, but Hezbollah leadership survived and perceived the war as a victory for their ability to stand their ground. In 2008, Israel turned the destruction it brought about in 2006 into a military doctrine. The 'Dahiya Doctrine' means the Israeli army retaliates, said Israeli northern front commander Gadi Eisenkot, with 'disproportionate attacks, including against civilian structures and infrastructure'.[19]

The term 'disproportionate' was crucial. It was meant both literally – Israel will use its overwhelming firepower without restraint or measure – and legally – Israel will flaunt the laws of war in which the principle of 'proportionality' is central.[20] Proportionality is the most macabre of legal principles. It does not forbid the killing of civilians in war but rather demands that 'civilian harm' is kept proportional to the significance of the military target. As such it proposes another type of exchange rate between military aims and civilian death. It was not that this relatively permissive legal principle was too restrictive for the army, but breaking international law became a value in itself, demonstrating that Israel could not be restrained by any legal and normative threshold, proportion or measure, or be confined to previous exchange rates. It celebrated its transgression, knowing too well it would suffer no real economic or diplomatic consequences and that protesters calling for accountability would be crushed by the police forces of many of the states of the global north.

Humiliated by the efficiency by which Palestinian fighters broke through the Envelope and the casualties it sustained, Israeli politicians called upon the army to 'bomb without distinction or mercy', and 'wipe Gaza off the face of the Earth'. On 10 October, Israeli minister of defence Yoav Gallant translated this sentiment into operational terms, declaring that he 'released all restraints' and unleashed the full force of the army on the cities and refugee camps of the Strip saying that 'we will eliminate everything'.[21] The Israeli air force then launched a three-week bombing

campaign so intense that military historians said it surpassed all other conventional bombing campaigns in the twentieth century, including the bombing of German cities in the Second World War.[22] With the declaration of the intent to annihilate Gaza the Dahiya Doctrine escalated into a genocide whose aim was the total destruction of Palestinian life in Gaza and the expulsion to Egypt of its population. The political and psychological foundations of the genocide that followed were not born out of the 7 October attack but had been gradually put in place throughout more than a century of colonisation, and eight decades of Jewish supremacy and apartheid.

The Gaza Doctrine

The first stage was the bombardment which lasted for three weeks. The bombing, as soon became clear, aimed to force Palestinians to the south part of the Gaza Strip as the first stage in their eventual expulsion from Gaza. By the end of October 2023, the army had dropped over 25,000 tons of munitions on Gaza's cities and camps, the majority targeting Gaza City itself. The Palestinian Ministry of Health recorded the first 10,000 dead.[23] Israel started running low on munitions. The US replenished those in one of its largest airlifts ever.[24] These bombs landed on residential and commercial tower blocks, shopping centres, schools, mosques, bakeries, banks, the beach promenade, hospitals, the legislative council, bookshops, publishing houses, libraries, hundreds of educational facilities, universities, food warehouses, restaurants, Gaza's supreme, administrative and constitutional courts. Hundreds of heritage and archaeological sites were likewise destroyed or damaged. Gaza City's Central Archive, containing thousands of current and important historical documents dating back over a hundred years, was destroyed. The bombing unhoused hundreds of thousands of Palestinians and destroyed the infrastructure essential for their survival.[25] Families were crushed under the rubble of their homes. Videos showed desperate rescue attempts, people digging by hand

through the rubble, and caught the piercing cries of the bereaved.[26] Many of the targets for the bombs were generated by an AI system named Habsora, Hebrew for 'the Gospel', that then chief of staff Aviv Kochavi made public with much fanfare in 2021, describing it as a major tool for 'the industrialisation of precise annihilation'.[27] The system, whose abuse in Gaza was exposed by Yuval Abraham from the news platform +972, was designed to synthesise data from all sources – intercepted phone conversations, mobile phone signals, aerial and satellite images as well as from human agents – and determine which buildings are used by Hamas activists. In all previous campaigns, buildings were being bombed at a faster rate than the army's intelligence could produce new coordinates and the air force ran out of targets. The process by which a civilian building is turned into a military target is referred to as 'criminalisation', the Gospel was an attempt to open this bottleneck and 'criminalise' a large number of civilian buildings. Like other artificial intelligence systems, the Gospel then purports to automatically 'criminalise' civilian structures.[28] The commander of Unit 8200, the intelligence corps unit that designed the system, referred to the synergy 'between humans and machines' as 'supercognition'.[29] However, rarely do intelligence officers and legal advisers dispute the result produced by the Gospel and rarely is a legal sign-off not given. The functional division of labour between the computer system that locates a target, the officer that approves it, the other officer that carries out a legal review, yet another officer that chooses the bomb, and the pilot that drops it diffuses a sense of responsibility for the 'industrialised annihilation'.[30]

When chief of Staff Hertzi Halevi presented the War Cabinet with the army's activities in the first 48 hours after 7 October, he bragged that the air force had already attacked one thousand five hundred targets 'based on exceptional intelligence and operational capacities'. 'Why not 5,000?' responded Netanyahu. Halevi said that 'the army doesn't have 5,000 authorised targets'. Netanyahu reportedly responded he was 'not interested in targets; flatten buildings, bomb with whatever you have.'[31] Some

parameters in the system were adjusted, more targets were produced and the rate of bombing increased. Looking at Gaza after two years of bombing and destruction, to claim that the system makes any meaningful differentiation is a mockery. The Gospel seems to have merely been the mechanism that allowed the army to criminalise an entire population and grind its cities into rubble. The army's use of AI for targeting was not exposed by journalists after October 2023, but rather made public by Chief of Staff Aviv Kochavi himself in 2021. The reason was that it gave wanton destruction an impression of scientific legitimacy, as if the Israeli army was going to great lengths to employ the legal category distinction.[32] Forensic Architecture researcher Júlia Nueno Guitart called that system 'individuated mass killing'. The targeting of specific buildings – tenuously conceived to be allegedly used by Hamas or other groups – becomes the mechanism by which mass annihilation was achieved.[33]

The go-to justification for destruction was the presence of tunnels. In January 2024 Israel's ambassador to the UK, Tzipi Hotovely, claimed that tunnels in Gaza were so pervasive that 'every school, every mosque, every second house has access to these tunnels' and suggested that all these buildings must be destroyed.[34] After nearly two years, that was the level of destruction achieved in practice. The entire subsoil under Gaza seems to have been considered a giant target, with the territorial surface with its homes, neighbourhoods, cities and camps considered by Israel to be a territorial scale horizontal shield, a legitimate target.[35]

Ground-penetrating bombs are dropped from high altitude so that they gather the speed necessary for their narrow frame to pierce the soil like a needle shot at high pressure. These bombs can penetrate some thirty metres of soil before exploding, forming huge craters. Buildings crushed into their shadow. The subsoil under Gaza has become a giant mass grave. These unrecoverable bodies cannot be registered in the official casualty count released by the Palestinian Ministry of Health, which lists only found and identified bodies.[36]

Often the depth bombs create more structural destruction to buildings above the surface than tunnels under it. As cavities within a solid medium, tunnels are hard to demolish. When a bomb hits a tunnel directly it creates only limited fall-ins, which can be cleared away or bypassed by diggers. The lethal effect of the bombing is usually achieved through a by-product of the subterranean blast. Explosions consume the available oxygen and release toxic gases. At high temperatures, carbon dioxide turns into highly toxic carbon monoxide (CO). After a blast CO and other toxic gases linger in the tunnel for days and can be lethal.[37] The use of lethal gas – even if a by-product of a conventional explosion – is prohibited by the Geneva Convention as chemical warfare.

Expulsion

While military spokespersons insisted that the army was operating according to the laws of war, Israeli politicians, ministers, high officers and soldiers on the ground made statements that were openly flouting the law. For them the killing of civilians and the destruction of homes and institutions was the intent, not the 'collateral effect' of bombing, or as the technologists often say, 'it was the feature not the bug'.[38]

On 13 October the Israeli president, Isaac Herzog, gave his now infamous speech: 'It is an entire nation out there that is responsible. This rhetoric about civilians not being aware, not involved, it's absolutely not true.'[39] These words, repeated in different variations by dozens of Israeli figures and elected officials from across the political spectrum before and since, captured a consensus in Israeli society: Palestinian society was itself the target.[40]

There was another statement released by Israel the same day. Delivered by air-dropped leaflets, social media posts and text messages, the 1.1 million residents of Gaza City and its environs were delivered the warning with which Part I began: 'For your safety and the safety of your families you must evacuate your

homes immediately and head to the areas south of Wadi Gaza.'[41] The two types of statement, communicated on the same day, one threatening Palestinians with total annihilation and the other purportedly instructing them what to do for their safety, continued the mode by which Israel camouflaged its atrocities with humanitarian rhetorics. Israeli spokespersons later claimed that the fact it warned Palestinians means the genocidal statements made by its politicians were said 'in the heat of the moment' and were inconsequential. Israeli lawyers argued in the International Court of Justice in The Hague (we will come back to this case) that 'the IDF has dropped millions of leaflets over areas of expected attacks with instructions to evacuate and how to do so, broadcast countless messages over radio and through social media warning civilians…and made over 70,000 individual phone calls' and that such a 'practice of mitigating civilian harm' demonstrates 'the precise opposite of any possible genocidal intent'.[42]

There was, however, no contradiction between the statements. Just as the warning leaflets dropped over al-Lydd and Ramle in July 1948 prefigured the massacres there, and led to the permanent displacement of Palestinians from these towns, Israel weaponised the 'humanitarian practice' of warning in conjunction with large-scale destruction as a means of expulsion, and expulsion was the strategic aim of the war. The 'death marches' formed in 2023 were similar to the death marches from these towns in 1948. The routes were repeatedly targeted by drones and jets. On 13 October the Forensic Architecture unit in Al-Haq documented a civilian convoy of vehicles attacked along Gaza's main artery, the Salah al-Din Road, in which Israel killed seventy Palestinians.[43] Two weeks later, on 3 November 2023, a video taken by a Palestinian fleeing south recorded dozens of dead bodies along the other 'safe route' of the coastal al-Rashid Road.[44] Palestinians who refused to leave the area north of Wadi Gaza, the text on the leaflet continued, could be 'identified as accomplices in a terrorist organization' and killed.[45] An officer on the ground confirmed this practice: once civilians had been

ordered to leave, the area should be considered as one where 'there were no uninvolved civilians…If you spot someone, shoot.'[46] The evacuation order thus turned civilians into a legitimate target, producing the reality that President Herzog's words conjured in his 13 October speech.

An estimated 400,000 out of 1.1 million who lived north of Wadi Gaza did not evacuate and cross south of the wadi. Others were unable to do so or had relatives that couldn't. Some did not want to leave their loved ones buried under the rubble. Some stayed out of attachment to their homes, refusing the idea of yet another displacement, or were distrustful of military orders and realised that if they left, Israel would permanently occupy northern Gaza.

Israel Katz, then minister of foreign affairs, warned on the same day the expulsion order was given, 13 October, that the army would not be providing 'an ounce of water and electricity to those who do not evacuate' and that it would continue to do that 'until they leave the world'.[47] Júlia at Forensic Architecture documented attacks on seventeen bakeries and the destruction of flour warehouses in and around Gaza City. She noticed that attacks on bakeries took place mainly during the day when queues formed while attacks on homes were mainly during the night when they were fully occupied.[48] By mid-November, there were no bakeries still in operation in Gaza City. The people who remained in the north lived in and amongst ruins, or in public buildings that were repurposed as shelters, surviving on whatever was left including reeds and animal fodder.

Later on 13 October 2023, a document prepared by the Israeli Ministry of Intelligence – a small ministry tasked with developing strategic policy – was made public. Its top recommendation was the full-scale expulsion of all Palestinians from the Gaza Strip into the Egyptian Sinai. Such expulsion 'will yield positive, long-term strategic outcomes for Israel'. Airstrikes and ground invasion, the document outlines, should be employed to push the civilian population from north to south. 'It is important to leave the travel routes to the south open to enable the evacuation of the civilian

population toward Rafah.' Once concentrated in Rafah, the document – only another confirmation of a long-standing Israeli strategic aim since 1948 and completely in line with what was already happening on the ground – suggested, another push would see them over the border to Egypt, where they would be initially housed in 'tent cities', and later in 'specially conceived cities in northern Sinai', far from the border where their displacement would turn permanent. Reflecting Israel's habit of presenting expulsion as a humanitarian necessity, the document recommended that Israel launch a 'public campaign' in Europe and the US to present the transfer 'as a humanitarian necessity' undertaken 'for the benefit of the citizens of the Gaza Strip'.[49]

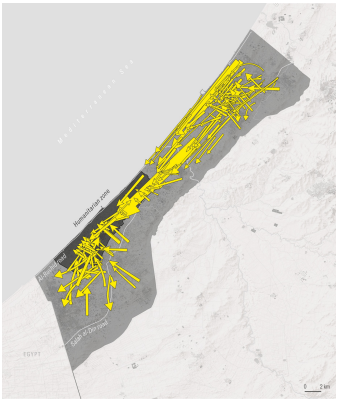
Amongst all genocidal statements pronounced by Israeli politicians in the wake of 7 October 2023, one stood out. On 28 October, three weeks after the attack, Benjamin Netanyahu quoted a part of a biblical verse: 'Remember what Amalek did to you.'[50] Other references to Amalek were already in wide circulation, brought up by politicians, journalists and military personnel. The message was not hard to interpret. The duty to 'remember' the attacks of the Amalekites on the Israelites after the exodus from Egypt was a call for annihilation. 'The memory of Amalek must be blotted out.'[51] The biblical command was to 'spare no one; but kill both man and woman, infant and suckling, ox and sheep, camel and ass'.[52] From the early days of Israel's assault on Gaza the verse was tagged to soldiers' social media posts, and later, when Israel's invasion began, to clips of Israeli soldiers committing atrocities. It was sprayed as graffiti on destroyed Palestinian homes, it was sung by soldiers preparing for raids and slowly became the rallying cry for the entire campaign. Its use by military personnel and government figures did not stop even after it was presented by the South Africa team at the International Court of Justice in The Hague as evidence that Israel was intent on committing a genocide.[53]

References to wiping out the memory of Amalek have had a prominent place in the history of settler colonialism. Amalek was invoked by European settlers to justify the murder of Indigenous

people in the Americas. German- and Afrikaans-speakers invoked the verses to justify annihilation of Indigenous peoples in southern Africa.[54] Israel's first prime minister, David Ben-Gurion, referred to the Palestinian refugees in Gaza as 'hosts of Amalek', and many Israeli atrocities against Palestinians in the decades since were committed under this slogan.[55] Historical and archaeological evidence about the Amalekites is scarce. Their language and culture are lost to time. Their existence was recorded only by their enemies. The Bible described them as a semi-nomadic group of tribes inhabiting parts of northern Sinai. Their territory started south of Wadi Gaza and roughly corresponded to that of the al-Tarabin tribal confederacy today. When Salman Abu Sitta told me he thought the earliest inhabitants of al-Ma'in were Amalekites, I understood his words as an act of defiance.

After 7 October 2023, calls for mass expulsion of Palestinians to Egypt were everywhere present in the Israeli media, society and the government.[56] Israeli and some US officials started lobbying Egypt to accept large numbers of Gaza's population.[57] Far-right Israeli ministers advocated settling an emptied Gaza with Jewish settlers.[58] Netanyahu confirmed that he was actively seeking to 'transfer' Palestinians out of the Strip.[59] This was the strategic aim of Israel's campaign, but despite all the killing, starvation and ungrounding of the following two years Israel failed to achieve it. One of the reasons was that Palestinians stayed in Gaza City despite all Israel's efforts to expel them. Another was that from October 2023, and in line with decades-long policy, Egyptian President al-Sisi refused to let Palestinians in en masse. It wasn't out of concern for the Palestinian cause. 'Transferring refugees from the Gaza Strip to Sinai would simply amount to relocating their resistance…and granting Israel the right to defend itself and its national security by conducting strikes on Egyptian land in retaliation.'[60] Within weeks of the expulsion order, about 1.5 million Palestinians were driven to displaced-persons camps in Rafah, squeezed against the border with Egypt. Israel was seeking to use the unprecedented support it

received from most European governments and the US after the 7 October attack to forever change the demographic reality on the ground and complete the expulsion of Palestinians from this part of Palestine. But the border held.



The layering of arrows (yellow) from all Israeli military evacuation orders communicated to Palestinians between October 2023 and 2025 showing the predominant direction of expulsion. Palestinians were displaced from the rain-rich north to the more arid south. In May 2024, when Israel realised they could not expel Palestinians to Egypt, the direction of displacement proceeded from the agricultural fields in the east to the al-Mawasi dunes. Forensic Architecture, 2025.

Zones

Architecture begins with the drawing of a line and the first line in the architecture of genocide was drawn on the map included within the 13 October expulsion order. The line was the path of Wadi Gaza (see image on this page). It was the only geographical element to be drawn within a contour map of Gaza. There were no other place markers on the map, no roads, no cities, no villages. Two arrows were drawn over the wadi line pointing southwards. The wadi thus divided Gaza into two types of spaces. The area north of the wadi, including Gaza City, was the political, business, cultural centre of the Strip. This was the area from which people were expelled, and anyone remaining was to be

killed. South of the wadi was an area into which people were to be collected and concentrated. I will refer to these two types of spaces as 'forbidden zones' and 'concentration areas'.[61]

The wadi line was historically understood as the threshold of the desert and the border of Palestine. The concentration area south of Wadi Gaza was the desert's threshold. A section of this part was designated a 'humanitarian zone' located on a large coastal sand dune called al-Mawasi. There could be no greater contrast between Gaza City with its universities, broad streets, markets, shopping malls and large hospitals and the dunes of al-Mawasi. The area had no life-sustaining infrastructure, no appropriate shelters and no medical facilities to cope with hundreds of thousands of displaced people from the urban north. The area was never safe and always inhumane. Displaced Palestinians in the humanitarian zone could also be killed by gunfire, bombs, invading soldiers, aerial, missile and drone strikes.[62] However, in the concentration area Palestinians were mainly exposed to a suffocating, slower form of killing. The imposed dense living conditions, lack of hygiene, food, water and medical infrastructure hastened the spread of disease and hunger. Over 40 per cent of dialysis patients died due to the lack of proper treatment and destruction of healthcare infrastructure.[63] Calling this zone 'safe' or 'humanitarian' was a smokescreen. Colonial powers historically used euphemisms for protection such as 'protectorates' and 'reservations' to displace and concentrate Indigenous people away from their most productive lands.

The Wadi Gaza line thus became the first element of Israel's architecture of genocide – separating 'forbidden' and 'concentration' areas. In the following months, when the army realised that its plan to completely empty Gaza City of its population had failed, and when it started invading the concentration area in Khan Younis and Rafah, the neat separation into north and south broke, the border between forbidden and concentration areas shifted, splintered, and multiplied. Forbidden and concentration areas appeared in different places, at different times. The same area or neighbourhood might shift between the

categories, often unknown to the people within it. Some 90 per cent of the territory of Gaza became forbidden at one stage or another. The borders between the zones would sometimes be marked on the ground with berms of piled earth and rubble, but most often the division was invisible. ‘No one tells the Palestinians what the red line is that they are not allowed to cross,’ a soldier was quoted as saying. ‘They find out the hard way.’[64] Instructions to evacuate were often unclear, contradictory and confusing, leading to widespread panic and terror.[65] Periods of telecommunications and internet blackouts imposed by Israel cut access to this information which started soon to be published mainly on the army spokesperson’s social media channels.

A photograph of al-Ahli Baptist Hospital taken in 1916, during the First World War and a year before the British occupation. The photograph is matched within a contemporary 3D digital model of the building. This ‘photomatch’ helped Forensic Architecture to accurately scale the model. Forensic Architecture, 2024.

Al-Ahli

On 13 October Israeli officers telephoned each of the twenty-two

hospitals in the forbidden zone of Gaza above the wadi line confirming that the expulsion order included all medical facilities, staff and patients. The hospitals were overflowing with casualties in addition to thousands of displaced Palestinians who crowded their courtyards, seeking shelter, on the assumption that hospitals would not be attacked. Hospital staff told the army that many of the patients were immobile, that trying to move them would risk their lives, and that they couldn't leave them behind. The army's sole response was to reiterate its evacuation orders and threats.[66] Hundreds of legal scholars and United Nations experts warned of genocide.[67] Staff at hospitals reported being fired on with warning missiles from drones. Evacuating hospitals was a crucial way, the army believed, to break the resilience of Palestinian society and facilitate the complete evacuation of the forbidden zone.

Four days after the expulsion order, at 6.59 p.m. on 17 October 2023, an explosion took place in the courtyard of al-Ahli Hospital in Gaza City. At the time the courtyard and the surrounding lawns were full of families seeking shelter, many sleeping outside in what was a warm autumn. Gaza's Ministry of Health reported the killing of 471 people.[68] Protests erupted globally.

The hospital was established as a medical mission of the Anglican Church in 1882 and became known as 'the English Hospital'. Ghassan Abu Sittah, a British-Palestinian plastic and reconstructive surgeon, who is also Salman Abu Sitta's nephew (the difference in the spelling of their surnames originated in different transliterations), was operating in the hospital at the time of the blast. In the immediate aftermath an Israeli journalist tried to justify the bombing saying they attacked a 'terrorist base' within the hospital.[69] But within hours, the army issued an official denial, alleging that a rocket fired by the Palestinian Islamic Jihad from the coastal area, south-west of the hospital, malfunctioned and landed short, in the hospital. An Israeli military spokesperson named Peter Lerner appeared on CNN and the BBC pointing to a printout of a still from a video aired on Al Jazeera, capturing a midair explosion that occurred seven seconds

before the hospital blast, claiming it to be the misfired rocket that later fell onto the hospital yard.[70] Sure of their ability to stir the narrative, military spokesperson Jonathan Conricus taunted Forensic Architecture on X to investigate the 'Hamas hospital sham'.[71] The people who crowded into the hospital courtyard believed Israel would not attack a hospital, and after it happened, most international media and governments didn't want to believe that Israel had attacked a hospital, despite the fact that by that time fifty-one attacks on medical infrastructure in Gaza – including a shell fired at al-Ahli's cancer-treatment ward – had already taken place, and despite the air-force bombing the area around the hospital at the time.[72] Many mainstream media, which initially reported on an Israeli strike, swerved to accept Israel's narrative, and so did the governments of France, the United Kingdom, the United States and Canada which quoted some undisclosed intelligence report.[73] Experts suggested that the small crater in the hospital yard could not have been the result of a large airdropped bomb.[74] But Israel has a large range of smaller munitions that could have resulted in that damage.[75]

On 20 October we posted our first study on the blast, undertaken with our colleagues in Al-Haq and the audio investigative unit Earshot.[76] Earshot was founded by Lebanese-British sound artist and our long-time collaborator Lawrence Abu Hamdan, who often refers to his job as an audio investigator as being a 'private ear'.

The team at FA surmised and modelled the shape and size of the crater from the video of the scene. A weapons analyst we sent the data to suggested that the shape of the crater was consistent with a projectile coming from the east – the direction of the Israeli-controlled side of the Gaza perimeter. Earshot studied the sound of the shriek of the munition as it was approaching the hospital and likewise suggested that the more likely direction was east to west.[77] This cast serious doubt on the army's claims that the source of the deadly explosion was a Palestinian rocket fired from west to east. However, we added that without the missile fragments – which were not publicly presented and that we

searched for in images of the devastated site but could not find – it was impossible to make a definitive assessment.[78] In the aftermath of attacks, bomb or missile fragments are often photographed and uploaded online. Many were quick to suggest that the fact fragments were not presented pointed to an attempt to hide incriminating evidence. However, in the rush and confusion of the massacre, with the necessity to evacuate the wounded and with Palestinians under relentless bombardment, it is not surprising that searching for and presenting these fragments was not the first thing on people's mind.

Disturbingly, the media analysis of the event was reached without much resort to Palestinian witnesses and survivors. We wanted to amend it. We were in close contact with Ghassan Abu Sittah who had returned to London after five weeks of treating patients in Gaza, only a few kilometres from his family's home village of al-Ma'in. He was at al-Ahli on the night of 17 October and survived the blast. With journalists banned entry by Israel, some of the most significant testimonies came from the medical workers. Medical evidence includes three distinct layers. Medical staff in Gaza are survivors of attacks on their hospitals and can deliver direct eyewitness testimony. They are also expert witnesses, able to identify traces of violence in the wounds of their patients. Often because hospitals function as destinations for displaced persons, medical professionals also become secondary witnesses to the accounts of their patients who share their experiences from near and far. Upon his return Ghassan spoke publicly about his experiences in Gaza and his testimonies included all these layers. His re-entry to Gaza was banned by Israel.

Together with Ghassan we decided to reconstruct the events of the night of 17 October 2023 as he experienced them. The reconstruction was undertaken using the same practice of 'situated testimony' that we had undertaken with his uncle Salman. The relation between the two testimonies, by members of two generations of the Abu Sitta family, demonstrated the continuity between the Nakba of 1948 and the genocide that

started in 2023, and the centrality of this family to the Palestinian history in the area.

Ghassan Abu Sittah delivering a ‘situated testimony’ about the 17 October 2023 blast at the al-Ahli Hospital.

A reconstruction of the munitions blast from the traces of shrapnel found on the surrounding walls (left). A still from a video Ghassan took after the blast is ‘photomatched’ within the 3D digital model (right). Forensic Architecture, 2024.

Using available photographs, we prepared a three-dimensional model of the hospital. When Ghassan came to our office we began the testimony by him adding more details to the model, the people inside, beds, medical instruments.[79] Each object was a testimony for the relation between medical staff and patients. When the model was complete, we could take a series of virtual walks through it. We started from an eye-level perspective of the

operating theatre where Ghassan was at the time of the blast. As Ghassan was speaking, Nour and FA researcher Elliot Bourne were simulating his eye level experience within the model as he moved through the hospital. ‘In the evening after we finished one of the surgeries,’ he told us, ‘I heard a missile screech followed by a huge explosion. Bits of the ceiling fell.’ He walked out of the surgery within the digital environment. ‘Here is the video I took.’ We overlaid a video he shot of the scene, in the way that perfectly matched his camera’s perspective with the model. The video captured the courtyard on fire and the desperate cries of the wounded and bereaved. ‘I could see the main courtyard on fire,’ Ghassan recalled. Fire from the ambulances and the palm trees illuminated the digital scene. ‘Everything in front of you is dead bodies,’ he recalled, his speech slowing down, clearly reliving the scene, as he walked past the bomb crater within the model. There ‘were bodies on the ground, on the grass’; he paused, stunned for a moment, then pointed to the exact location where he saw the dismembered forearms of a child. When he regained his focus he rushed back inside to treat the wounded. A video sent to us by Al Jazeera showed their bureau chief in Gaza City, Wael al-Dahdouh (who lost his wife and two of his children a week later), walking through hospital floors awash with the blood of the wounded. Ghassan told us: ‘The wounds were clean. They didn’t have dust and dirt and gravel, and they were just sharp cuts, amputations.’ This suggested to him that the rocket was likely to have been a fragmentation bomb of the kind used by Israel, which contained hundreds of sharp shrapnel pieces flying like blades out of the blast point, and were much more lethal than the explosive charges on Palestinian rockets. ‘You can tell the difference between a fragmentation bomb and a regular bomb looking at the wound.’

Ghassan was later evacuated alongside the dead and wounded to the nearby al-Shifa medical complex, the central hospital in Gaza City, where he continued treating patients. The morgue in al-Shifa was full. So was the refrigerated food truck that served as an additional morgue. The bodies of the deceased were placed in

the courtyard.[80] There, surrounded by the bodies of some of those killed in the blast, and alongside other colleagues, Ghassan spoke at an improvised press conference.[81] He told us that in the aftermath of the blast he lost his mobile phone, and speaking at the conference was his way of sending a sign of life to his family back in London that knew he was operating at al-Ahli. A relative saw the press conference on Al Jazeera and called his wife.

Clearly rattled Ghassan said at the conference: 'This morning when I drove into the hospital, I noticed how full the hospital was with families that sought refuge in the hospital thinking that it will be a safe haven, it is these very families that are now dead or critically wounded as a result of this attack. This is a war crime that the world has seen coming. Israel was warning the entire world that it was going to attack Palestinian hospitals, and it did exactly that. Every western politician who has declared unconditional support for Israel's war effort on the Palestinian people has the blood of these children on their hands…if Israel gets away with it again then more war crimes will be committed, and more hospitals will be targeted.' This was prophetic. Ghassan told us that the blast at al-Ahli Hospital was the moment when it seemed clear to him that it 'stopped being a war, and it became a genocide'.[82]

It was clear to all Palestinians we spoke to who had bombed the hospital, but given the credibility given by many in the western media to Israeli spokespersons, it was important to debunk Israel's narrative. Their media strategy was following a playbook, and we wanted to carefully show how their narrative was constructed.

We started with the still frame of the midair explosion presented by Israeli army spokesperson Peter Lerner which he claimed was the failed Palestinian rocket. The original video used by Al Jazeera from which the still frame was extracted was shot by Palestinian journalist Hamdan al-Dahdouh and was available online. Also online was another video of the midair explosion, captured on a south-facing CCTV camera located on the roof of a hotel near Tel Aviv (Gaza is roughly seventy kilometres away and

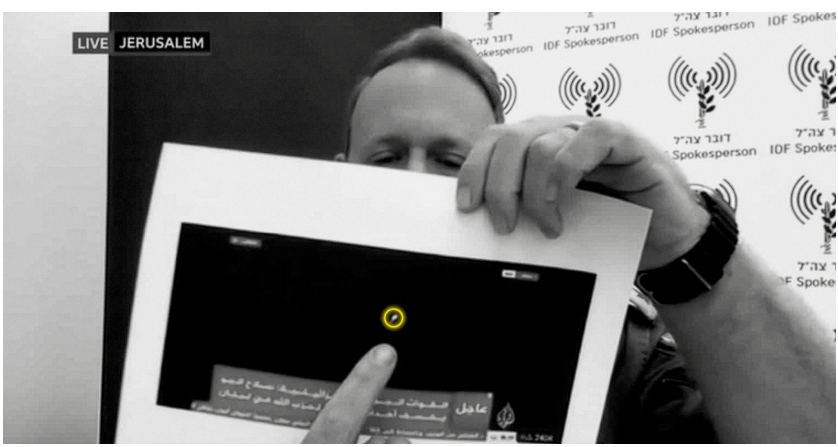
the bombing of Gaza could be in full view of those that wanted to see it). Both videos showed the flares of a projectile moving through dark skies before exploding. Looking at each video separately it is impossible to locate the projectile, but when two videos from two perspectives are brought into a model, depth can be added, and a three-dimensional reconstruction can take place. Nick Masterton at Forensic Architecture placed the two videos within a simulated sphere of the sky. Triangulating the videos allowed us to identify the exact location of the explosion. It was over the Envelope, not the Gaza Strip, and it took place 5,000 metres above the surface. It takes thirty seconds for an object to fall from this altitude, but the hospital blast took place only seven seconds after the mid-air explosion. It was clearly another of the dozens of munitions that were simultaneously exploded at that very moment. We traced backwards the trajectory of the flare that ended up in this explosion. It led to a point near the kibbutz settlement of Nahal Oz. A satellite image of the place from previous days showed an Iron Dome anti-rocket missile battery there. The midair explosion in the video still that the Israeli spokesperson had pointed to was not a failing Palestinian rocket but the blast of an Israeli Iron Dome missile.[83]

There was another gap in the Israeli narrative. The number of casualties and widespread damage in al-Ahli Hospital were never before seen as a result of any previous Palestinian rocket that landed in Israeli settlements. Israeli spokespersons, and several news agencies, as well as, surprisingly, investigators from Human Rights Watch (HRW), suggested that the high number of casualties may have been created by the exploding unspent fuel of the misfired Palestinian rocket fired from Gaza's coastal area.[84]

Working together with a rocket scientist we learnt that rockets burn their fuel at take-off stage and continue their ballistic trajectory by inertia. As long as a rocket burns fuel a flare is visible at its tail; this was true of the interceptor we identified. At Forensic Architecture, Kishan San was tracking each of the flares in the salvo that the Israeli army spokesperson pointed to as having included the 'misfired rocket'. All flares were extinguished

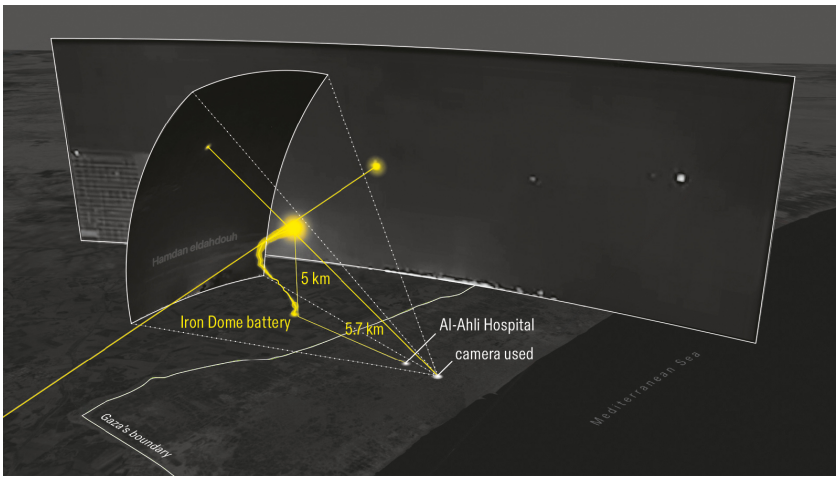
well before they passed above the hospital. If any of these rockets were to fall on the hospital, they would have had no fuel in them.[85] While neither the unburnt fuel theory nor the midair explosion in the Al Jazeera video simultaneously employed were true, both could anyway not coexist. The midair explosion would have burnt off the fuel in the rocket's tank.

An Israeli military spokesperson released another piece of 'evidence' that didn't align with the rest: an audio file. It purported to contain an intercepted conversation between two supposed Hamas operatives who said that the rocket that landed in the hospital was launched by Palestinians.[86] Earshot listened carefully to the audio and identified several cuts within it, confirming that the audio recording was edited. The conversation was not even undertaken between Hamas operatives at all. The news platform +972 spoke to a human rights defender in Gaza – a person who has written critical reports of Hamas – who said he was surprised to hear his own voice in this audio. The conversation had him speculating casually with a Palestinian friend about what had happened.[87] It was later revealed that the audio file was produced by a newly founded unit within the Israeli army intelligence corps colloquially referred to as the 'legitimisation cell'. The aim of this unit was to present material to sway public narrative around Israeli atrocities.



BBC broadcast from 18 October 2023 with an Israeli army spokesperson pointing to

a still from an Al Jazeera video, claiming that the midair explosion (marked here with a yellow circle) was a misfired Palestinian rocket that later fell on the hospital.



Forensic Architecture intersected the Al Jazeera video with another taken from a hotel near Tel Aviv, demonstrating that the trail leading to the midair explosion (yellow) originated from an Iron Dome battery outside of Gaza and could not have been the source of the hospital blast as falsely claimed by the Israeli army. Forensic Architecture, 2024.

In any event, the audio tape introduced yet another contradiction. The claim made in the conversation was that the rocket was fired from a cemetery just metres outside the hospital and did not align with Israel's earlier claims that the failed rocket was fired from the coastal area more than ten kilometres away. These contradictions were typical of Israel's scattergun approach to justifying atrocities. Israeli spokespersons flood the media with simultaneous contradictory statements that do not add up to a coherent narrative but create a 'smokescreen' and seed doubt in the minds of those that are susceptible to doubt.[88]

Israel is yet to provide any evidence to support the claim that the source of the blast at al-Ahli Hospital was a Palestinian rocket. However, as media scholar and director of journalism at the University of Essex, Muhammad Idrees Ahmad, wrote: 'That a "failed rocket" from Gaza was responsible for the atrocity soon congealed into an article of faith that nothing could dislodge…By

muddying the water in the case of the most spectacular atrocity in Gaza, the media became leery of reporting on subsequent atrocities until they became so mundane that the perpetrator could openly publicise them without fearing consequences.'[89] The exoneration of Israel from one of the most lethal attacks of the war would also help Israel extend its attack to more hospitals – as Ghassan had already predicted in his speech in al-Shifa a few hours after the blast.

Following the al-Ahli strike, we documented the way almost all the hospitals in the forbidden zone north of Wadi Gaza – the Indonesian Hospital in Beit Lahiya, al-Awda Hospital near Jabalia, al-Wafa, al-Rantisi and al-Quds hospitals in Gaza City, the Turkish–Palestinian Friendship Hospital near Wadi Gaza, and of course al-Shifa Hospital in central Gaza City – were targeted by Israeli strikes. Some were directly invaded. Later all hospitals south of Wadi Gaza experienced a similar fate.[90]

On 20 October Palestinian physician and human rights advocate Dr Mahmoud Abu Nujaila who was operating in al-Awda Hospital in Gaza City wrote on a whiteboard, normally used for planning surgeries: 'Whoever stays until the end will tell the story. We did what we could. Remember us.' On 21 November the Israeli army targeted the floor in which Abu Nujaila was operating, killing him alongside two other physicians.[91] Médecins Sans Frontières, the organisation for whom he worked, posted a photograph of the same whiteboard, still carrying the message, torn and damaged after the strike. Israel was set on systematically dismantling Gaza's healthcare infrastructure. Out of the Gaza Strip's thirty-six hospitals, we documented the way thirty-five went out of service at one or more points throughout the genocide.[92] The systematic annihilation of medical practitioners included Dr Hamdi al-Najjar, killed along with nine of his children in a targeted attack on his family house in Khan Younis on 23 May 2025. A strike on 5 July on the tent of physician Dr Khalooq Mousa Khafaja, a gynaecologist operating in al-Nasser hospital, killed him along with his three children near Khan Younis.[93] Dr Marwan al-Sultan, the director of the

Indonesian Hospital, was killed in Gaza, as was Dr Eyda Khader, head of the midwifery department at the Gaza Ministry of Health who was targeted alongside her sister Faten who worked as a nurse. Dr Marwan al-Sultan, director of the Indonesian Hospital, was killed with his family in an air strike. Deib al-Batah, the chief nurse at the Indonesian Hospital and Dr Ahmad Nabhan, head of the emergency department, were killed by an Israeli drone missile in Jabalia refugee camp; the nurse Ahmed E'dal Abu Khalal was killed in al-Mawasi.[94] On 14 July 2025 Majed Salah, a nurse, was killed in a strike on his tent in Khan Younis along with his three daughters. On 6 June, a strike on a residential building in north Gaza killed five physicians and a nurse from a single family. According to the Palestinian Ministry of Health, more than 1,500 health workers have been killed in Gaza since 7 October 2023.[95]

Al-Ahli hospital was bombed again on 13 April 2025. That time there was no longer a question of who'd done it. 'DISMANTLED: Hamas Command and Control Center Inside al-Ahli Hospital' posted the official account of the Israeli army.[96]

On 18 October, Ain Media's director Rushdi al-Sarraj visited al-Ahli Hospital, writing to Shourideh that 'everything is grey and red' referring to the broken concrete and blood he saw everywhere around the structure. Since the war, grey dust from pulverised concrete covered every surface, every remaining tree, every face. The monochrome is punctured only by the red of wounds. Rushdi shared the post of our initial investigation, and it will forever remain at the top of his feed as his last. He was killed in an air strike, four days later, on the morning of 22 October, when he was in the house of his father, Yahya al-Sarraj, the mayor of Gaza City. Shrouq al-Aila, Rushdi's wife, a researcher and a journalist who worked closely with us, told Shourideh that they were having breakfast together when they heard the shriek of an approaching bomb. Rushdi threw himself on her as a shield.[97] 'Everything is grey and red' became the title of an exhibition Forensic Architecture arranged in Rushdi's memory.[98]

Ground Invasion

After 7 October, the Envelope, whose settlers had been evacuated elsewhere, became the staging ground for the Israeli army to organise its forces. Soldiers were taken to visit the ruins of the kibbutz settlements to instil vengeance. Three weeks later, on 27 October 2023 the ground invasion began. Israeli armoured columns crossed into the forbidden zone north of Wadi Gaza. The ground invasion speeded up the expulsion of Palestinians from the north towards the concentration areas in the south. Ministers said the army invaded to permanently occupy the Strip and that Israel would remain and build the settlements on the ruins of Palestinian cities. Military vehicles flew the flag of the settlement movement.[99]

The main thrust was along the northern bank of the wadi. The task of the D9 bulldozers in the armoured columns was to carve new routes through Palestinian neighbourhoods, destroying homes and farms in a wide margin on both sides. The bulldozers were also tasked with creating fortified enclosures. Some of these were relatively large, with several contiguous compounds, made out of the reshuffled soil and rubble of destroyed neighbourhoods. Slowly an entire military architecture emerged, growing within and gradually replacing Gaza's cities from whose rubble they were made. At the edge of the encampments, the bulldozers piled rubble into a topography of artificial hills crowned with sniper positions. Other mounds enclosed detention centres where officers of the Shin Bet interrogated Palestinian detainees using various types of torture.

In early November we noticed the bulldozers started marking a boundary line along the northern bank of Wadi Gaza. Just like the plough line of 1950, the bulldozer line went right through fields, farms and villages. It marked the border of the area that no Palestinian was allowed to be in. A soldier told the Israeli newspaper *Haaretz* that 'anyone who crosses the line is a terrorist. There are no exceptions, no civilians.' Anyone who enters the area north of the line 'gets a bullet in the head'. Soon 'a line of

dead bodies' was formed along the carved border. Even from afar, the soldiers could tell where the line was because they could see with their binoculars packs of stray dogs feeding on corpses.[100]

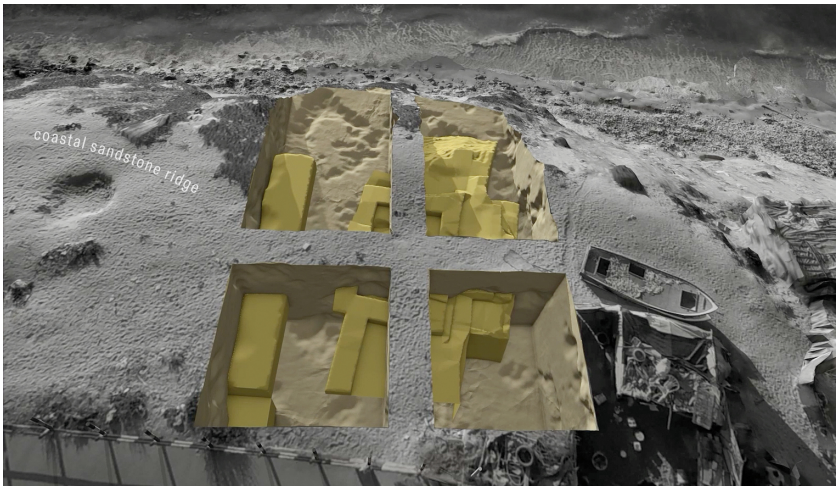
The other thrust of the invasion progressed from north to south down the coastal route, known as al-Rashid Road. Bulldozers ungrounded the road, tearing through the asphalt all the way to Gaza City. Along the city's coast, right by al-Shati refugee camp, is one of the area's most important archaeological sites, the Iron Age then Hellenic and then Roman port city of Gaza that the Greeks called Anthedon. The ancient hub of trade, migration and pilgrimage was excavated by Palestinian and French archaeologists, starting in 1995.[101] In 2005 the Palestinian Ministry of Antiquity decided to rebury the site under sand for its protection from Israeli bombardment. In the decades that followed, cycles of aerial bombardment punctured through the sand and exploded within the precious remains. From 2021, a team in Forensic Architecture led by Sarah Nankivell worked with Rushdi al-Sarraj and archaeologist Jean-Baptiste Humbert of the École Biblique of Jerusalem to understand what parts of the site were damaged by Israeli attacks. Using images taken by Humbert's team and others found on open sources, we created the first model of the site buried under the coastal sand. We also identified thirty craters of Israeli bombs that landed on the site during several rounds of bombardment between 2005 and 2021. In November 2023, the Israeli invading columns set their headquarters right on top of this ancient site. Comparing the contemporary damage to the site with our model we learnt that the bulldozers piled earth mounds out of parts of the ancient wall, a Roman fountain, the public square, several Hellenic and Roman villas, and the Byzantine cemetery.[102]

In January 2024 the bulldozers piled soil rich in archaeological remains to assemble a wave breaker to protect large water pumps that were sunk into the sea. The army was carrying seawater through giant pipes and pouring them into the tunnels to flush out anyone inside. It took a few months for the army to realise that their 'Project Atlantis' was a failure. Shortly before October

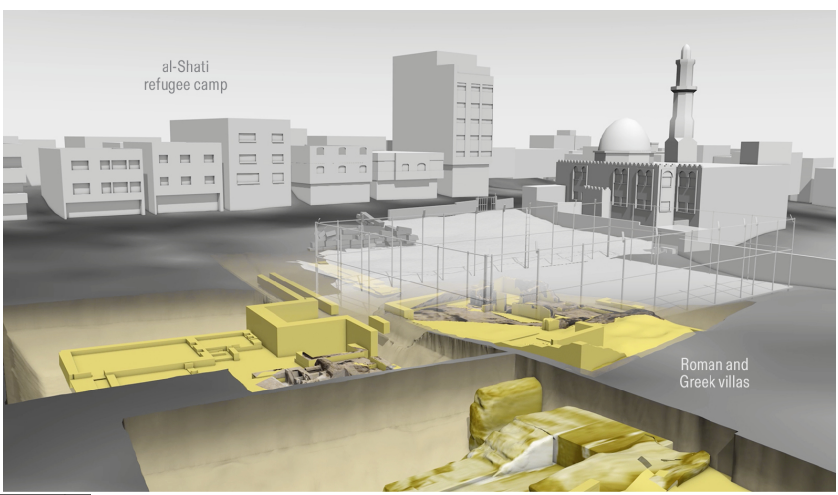
2023, the tunnels were equipped with metal blast doors. When shut, the doors held the water long enough for it to drain into the subsoil through the tunnels' exposed floors.[103] It might have not been useful militarily, but it was environmentally consequential. Seawater contaminated Gaza freshwater aquifers, which were already overused and polluted after years of siege. Water specialists claimed the damage would last for generations. The result was similar to the famous retribution the Romans inflicted on Carthage after years of war. They demolished the city, ploughed it over, and later sowed the ruins with salt to prevent future crop growth.[104]

Another thrust of the ground invasion closed in on the refugee camp of Jabalia north-east of Gaza City. The soil in this part is rich clay. One of the farms in the agriculturally active area belonged to the Abu Suffiyeh family. They tended vegetable gardens and one of the last olive, pomegranate and citrus orchards.[105] Shourideh, Samaneh and Lucia Rebolino mapped the systematic destruction of agriculture in this area. They noticed that the Abu Suffiyeh farm was completely dug out by bulldozers, the fertile ground was piled into high earth mounds and carved down the middle with a new military route. In early 2024 a member of the family – his name is protected – sent us a voice memo, saying of his land: 'There is almost nothing to recognise there. No traces of the land we knew. They totally erased it…It used to be a lively area, but now there is no life left here at all.'[106]

At close to the same time, our researchers mapped the way bulldozers ungrounded cemeteries in Beit Hanoun, Jabalia and Gaza City, piling grave sites into a protective architecture of mounds. Destroying archaeological sites, cemeteries, the aquifer and the soil seeks to erase a people's relation to their past and their future.



A model of the exposed archaeological remains of the ancient city of Anthedon. Remnants of an Iron Age wall.



Remains of Roman and Greek villas. In 2005, the exposed remains were covered by sand for protection. Since 2008, the site has been bombed dozens of times by the Israeli Air Force. In November 2023, the site was dug up by Israeli bulldozers and piled into earth berms. Forensic Architecture, 2022.

Al-Shifa

Targeting the healthcare system was the army's way of breaking Palestinian resilience grounded in Gaza City's most important infrastructure. The al-Shifa medical complex was the largest and best able to maintain conditions to support life in this part of the Strip. On 27 October 2023, on the same day that the army began its ground invasion, military spokespersons released a computer animation of a cartoon-like three-dimensional model purported to represent what happens under al-Shifa: interconnected tunnels with control rooms, headquarters, weapon storage facilities, offices and meeting rooms.[107] Dive under the surface of the earth and the viewers are taken from the genre of documentary into the space of fiction and fantasy that can only be illustrated by models. 'That information is ironclad,' insisted Israeli spokespersons and the clip was circulated on all the army's social media accounts including through Netanyahu's own account. From there the message reached media platforms and TV stations worldwide.[108] An investigation by activist, photographer and former FA collaborator Oren Ziv for the media platform +972 revealed the existence of a new military unit, consisting of three-dimensional modellers and animators, nicknamed the 'after-effects cell'. If the 'legitimisation cell' discussed earlier was in charge of releasing visual material to support Israel's claims, the 'after-effects cell' was there to create it. (After Effects is the name of a popular software used to add special effects to videos.) The 'cell' was part of a new communication strategy that the army was developing. When the team at FA saw the animation of al-Shifa – the first and crudest of a kind that would be popularised throughout the genocide – we felt the army was trying to adopt for their own propaganda purposes the language of groups including our own who investigate their crimes. FA researcher Elizabeth Breiner noted how the army uses the legitimacy that such visual language confers, trying to give the impression that a careful factual analysis has been undertaken, without attempting to meet any comparable methods and standards of verification. The aim was not to clarify but to blur facts, she said, to destabilise people's ability to distinguish real from fake. The army

anyway doesn't allow journalists and human rights investigators into bombed-out sites, making these illustrated claims difficult to refute.[109]

The burnt and destroyed al-Shifa Hospital showing the central courtyard completely ungrounded. By cross-referencing images and testimonies, Forensic Architecture marked the location of a desecrated mass grave and a makeshift burial ground, and other areas in which human remains were visible. @falasteen47, 2024/ Forensic Architecture, 2024.

The circulation of this animation was also an advance justification for the army's planned attack. The hospital was by then a shelter for an estimated 45,000 displaced Palestinians. The Israeli government said it had 'strong indications' that hostages were held there. Nour and Joshua Richards at Forensic Architecture built a digital three-dimensional model of the hospital in which they located many of the testimonies and videos posted from it, creating an evolving archive of what happened in the hospital day by day. On 10 November an Israeli shell hit the

hospital yard, killing seven.[110] Supply routes were cut. The hospital ran out of basic medical equipment. Ghassan Abu Sittah, who moved from al-Ahli to work in al-Shifa after the former was struck, reported that without basic medical supplies he was forced to start 'using washing-up liquid then vinegar to clean the wounds'.[111] More strikes followed. Lack of fuel forced blackouts. Doctors had to remove premature babies from incubators, trying to keep them warm under blankets. On 12 November the hospital was forced to bury the dead in the courtyard. An improvised cemetery grew to contain over a hundred graves. Another, this time, mass grave was soon made. On 15 November, after the army ceremonially blew up the Palestinian Parliament building, Israeli soldiers broke into al-Shifa.[112] On 18 November, the last of the medical staff and civilians were forced out. On 23 November, the director of al-Shifa, Muhammad Abu Salmiya, was arrested and taken to Israel's main detention camp in Sde Teiman where he later said he was subjected to 'almost daily torture' including assaults with batons and dogs, deprivation of food and medicine, as well as physical and psychological humiliation.[113] After the army established itself within the emptied hospital, military spokesperson Daniel Hagari pointed to a tunnel entry at the edge of the hospital yard. The tunnel led to a small room, nothing like the extensive multi-layered 'command and control centre' modelled by the army's 'after effect cell'. In November 2023, former prime minister Ehud Barak claimed that some of the photographs released by the army appeared to be underground shelters built by Israel in the 1980s. No captives or hostages were found in the hospital.[114] The devastation made it almost impossible to imagine Palestinians would be able to reopen the al-Shifa hospital, but they did so in early 2024.

On 18 March 2024, the Israeli army raided al-Shifa Hospital for a second time. The aftermath of the raid was captured by a video taken from the roof of the emergency building. This time the hospital compound was completely burnt. The entire paving in the courtyard was ungrounded, the signature mark of the genocide. Nour and Joshua carefully marked the area where the

improvised burial grounds were, shocked to realise the graves were desecrated with the earth that held them reshuffled. Videos showed body parts poking through the earth mounds.[115]

Carved Star

In the last week of November 2023 a temporary ceasefire, mediated by Qatar, came into effect. One hundred and five civilians taken hostage on 7 October were released, including eighty-one Israelis, mostly women and children, and twenty-three workers from Thailand and one from the Philippines. Three hundred Palestinians, mostly women and teenagers, were released from Israeli prisons. Israel allowed in some humanitarian aid. The hope was that this ceasefire would be extended into a permanent one, but on 1 December the army resumed its attacks. Israel used the ceasefire to build up its forces outside Khan Younis, the largest city south of Wadi Gaza, which it considered to be Hamas's stronghold. On 2 December evacuation orders sent the residents of Khan Younis to Rafah and to the so-called humanitarian zone in al-Mawasi. On 5 December 2023 the army invaded the city. Moving like a herd of elephants, destroying everything in their path, crushing the fields, uprooting orchards, tearing through irrigation pipes and water canals and carving new routes through dense neighbourhoods. Videos showed the huge pond of raw sewage forming along the tank paths, in the centre of the city, and which remained for months.[116] Later, bulldozers flattened every building on both sides of this military route. This path of destruction was one of fifteen such routes leading from Israeli military bases in the Envelope into the heart of Gaza's cities and camps.[117]

The armoured columns were closing in on al-Nasser Hospital, the largest in Khan Younis, which had suffered the same sequence of military attacks as had al-Shifa. The hospital ceased to function, and all patients and staff were expelled. By 21 December the official death toll of Gaza's Ministry of Health passed 20,000. The ministry's count is conservative and does not

reflect the total number of fatalities. It does not include the thousands of people missing and those killed through indirect causes as a result of injuries and illnesses that could have been treated if the healthcare system had not been destroyed.

From December 2023 expulsion orders were communicated on a map posted by the army, which divided Gaza into more than 600 irregularly shaped blocks. Each displacement order named the blocks to be evacuated and the blocks to which Palestinians should go, shifting people from forbidden to concentration zones like moves on a chessboard. The status of the blocks regularly shifted. Areas to which Palestinians were ordered to go could soon afterwards themselves receive eviction orders.[118] We have documented instances in which Palestinians were attacked when returning to their homes after the eviction order had expired. American physician Irfan Galaria, who worked in the European Gaza Hospital in Khan Younis, reported treating children with sniper shots to the head. They were shot, he said, by remotely piloted quadcopter drones armed with sniper guns when returning to their homes after the army retreated; none survived.[119] Between October 2023 and the end of January 2024, a young couple from northern Gaza, whose names must still be protected, were displaced more than a dozen times, never staying anywhere for more than a few days at a time. Every place they were sent to was subsequently attacked. Their story and testimony was collected by Palestinian novelist Susan Abulhawa, who has written the account, focusing on 'the molecular structure of every fact' and asked us to participate in the analysis.[120] Shourideh worked with Forensic Architecture researcher Lola Conte to analyse their journey.

The husband and wife left their home in Beit Hanoun at the north-eastern corner of the Gaza Strip on the first night of the war. They headed out to the husband's brother's home in the eastern part of Gaza City. When the house was attacked, they sought refuge in a church on the south side of Gaza City. Slowly the group they travelled with grew to some seventy-five people. It included his parents, uncles, aunts, their spouses and children,

and a few of their neighbours. The wife's family home was bombed, and her father, siblings, aunts, uncles, cousins, grandparents, nieces and nephews were killed. Her mother, she learnt only later, miraculously survived. Expulsion orders sent the couple to a school building near the coast. The area was heavily bombed, and they were forced to move to the destroyed neighbourhood of Shuja'iyya in eastern Gaza. Evacuation orders and advancing tanks made them flee again to a medical clinic in the western part of Gaza City. The army sent quadcopter drones to the area. Speakers on the drones ordered them to leave. To improve their chances of survival, the group divided. Children were split up between parents. One of the people in the group was shot by a sniper for no apparent reason. The couple arrived at a small garden in the old city of Gaza; the garden had been turned into an improvised cemetery. Before long, the cemetery was surrounded by tanks. The group moved again. On 23 January they arrived at one of the buildings of al-Azhar University in the centre of Gaza City where they found refuge in one of the classrooms. Five days later a quadcopter flew into the room and shot at the walls. A few moments later soldiers burst in. 'At least eighty of them,' she said. They separated the men from the women and children. The men were split into two classrooms and forced to walk, hands tied, in their underwear and barefoot, on shattered glass in front of the eyes of their family members. The husband said 'the soldier started hitting our faces as hard as he could'. He then felt a different kind of pain, saying that 'with blades they cut our backs'. For four days, the wife listened to the screams of the men. On 31 January 2024, the soldiers ordered the women and children to leave the university and walk south along the coastal al-Rashid Road and cross the bridge south of Wadi Gaza. The wife said: 'I was ready to die but I wasn't going to leave without my husband.' When she recognised him by his red underwear, she took off his blindfold, 'kissing him, hugging him, promising to die with him if that's what it took'. For some reason, the soldiers cut the plastic ties on his wrists and let her take him with her. Bleeding, famished and barefoot they walked down the

beach road while ‘the naval gunboats were shelling. Along the coast were the corpses of people displaced before us.’ She described the horror of seeing ‘dogs feeding on the bodies’. When they arrived with relatives in Deir al-Balah, she took off her husband’s shirt and noticed that his back was carved with a scar in the shape of the Star of David.[121] In Gaza we have seen the star spray-painted on the doors of Palestinian properties coveted by soldiers and settlers. In at least three places and at three separate times, we saw the Star of David carved by bulldozers on the ungrounded surface, meant to be seen by satellites, as if taunting those like us who were monitoring Israeli crimes.

South Africa v. Israel

On 8 November, Al-Haq, together with two other human rights groups, Al Mezan and the Palestinian Centre for Human Rights (PCHR), filed a submission with the International Criminal Court (ICC) urging it to investigate Israel for genocide and issue arrest warrants for Israeli leaders.[122] All three groups would be sanctioned for this act by the US in September 2025. By the time I travelled a few months later to the Al-Haq offices in Ramallah to meet with the Forensic Architecture team there, it had grown from three to ten young researchers, working under the guidance of Ashraf Hamdan, a graduate of the architectural school of Birzeit University near Ramallah, with the kind of creative energy that combined the spirit of an architectural studio with the buzz of a newsroom. The young team understood their role to be more than that of traditional human rights researchers documenting atrocities, and were working hard to record Palestinian testimonies, the lived experience of people in Gaza, their resilience, struggles and aspirations. Shawan Jabareen, the Al-Haq director who cultivated this team, told me that he saw in it the future of the organisation. At the end of 2023, Ashraf told us how much the organisation’s work had had to adapt. For the first time since it was founded in 1979, Al Haq could not rely on their field researchers in Gaza, who were, like other Palestinians in Gaza,

targeted and displaced. This made the unit's techniques essential for Al Haq to directly engage with testimonies and videos recorded by individuals of communities in Gaza.[123] The young team was trying to keep up with the rate of Israeli attacks, providing the evidentiary basis for the legal claims brought by their organisation. They were themselves under occupation and military raids were happening all around them while they were documenting military and settler attacks elsewhere in the West Bank which had escalated in the shadow of the genocide in Gaza. But they were also in the midst of attacks on their cities. They were working, Ashraf told me, with gunfire ringing in their ears.[124] At the end of December 2023, the energy of the mass protests which had gathered worldwide under the slogan of 'stop the genocide' – the largest public protest movements since the invasion of Iraq in 2003 – found its way from the streets to international courts. The government of South Africa submitted a petition to the International Court of Justice (ICJ) in The Hague, charging Israel with breaching the Genocide Convention for actions 'intended to bring about the destruction of a substantial part of the Palestinian national, racial and ethnic group'. The Genocide Convention is unique amongst international laws. It is meant to not only punish genocide but to pre-empt it as soon as credible signs of it accumulate. All signatories to the convention are required to act to prevent a genocide that is seen to be about to happen or is happening.

Palestinians in Gaza and elsewhere did not need a legal formulation to know that what was unfolding was a violence aimed at their annihilation, but the fact that such submission was being made, and particularly by South Africa – with its history of settler colonialism, apartheid and genocide (Namibia, which was occupied by apartheid South Africa, was the site of the first German genocide in the early twentieth century, as I will later unpack) – generated a sense that Israel and the states that supported and supplied it were being put on trial by the previously colonised states of the global south. South Africa has not only experienced settler colonialism but has also overcome its

systemic racial discrimination under apartheid. Its history gave South Africa the moral authority to act and instilled the hope that such action might have consequences.[125] The case provided legal tools to support the political dynamics already in place and gave credence to the depiction of Israel's atrocities as amounting to genocide.

South Africa cited calls for annihilation by Israeli politicians and military figures, the killing of 23,000 Palestinians (the official number gathered by the Palestinian Ministry of Health at that time), the majority of them women and children, and the destruction of most life-sustaining infrastructure. It requested that the ICJ issue a binding legal order, prior to a hearing on the merits of the application, that would require Israel to 'immediately suspend its military operations in and against Gaza'. Israel's Ministry of Foreign Affairs responded by calling the proceedings baseless and antisemitic, a 'blood libel' no less, and accused South Africa of functioning as the legal arm of Hamas.[126] The ICJ was established after the Second World War to settle disputes between United Nations member states. A case can only be brought by a member state against another. Because of the pre-emptive nature of the Genocide Convention, genocide cases must be heard almost immediately, with the court expected to issue 'provisional measures' if the court finds it plausible that a genocide is unfolding.

On 11 January 2024 we followed developments as South Africans of different backgrounds presented in calm legal idiom their argument against Israel at the Peace Palace in The Hague. The case not only dealt with what happened on and since 7 October. The South African team began by addressing Palestine's longer experience of Israeli settler colonialism. Vusimuzi Madonsela, South Africa's ambassador to the Netherlands where the court is located, spoke about Israel's 'seventy-five-year-long apartheid, its fifty-six-year-long belligerent occupation of Palestinian territory and its sixteen-year-long blockade of Gaza'.[127] Ronald Lamola, South Africa's minister of justice, began by stating that the country 'unequivocally condemned the targeting

of civilians by Hamas and other Palestinian armed groups and the taking of hostages on 7 October 2023', and then spoke on behalf of the millions of people around the world who were utterly appalled by the mass slaughter, the destruction of life-sustaining infrastructure, hospitals, schools, and the displacement of practically Gaza's entire population.[128] South African lawyer Tembeka Ngcukaitobi quoted statements made by Israeli politicians, military leaders, officers and soldiers that stated clearly that Israel was seeking to destroy Palestinian society in Gaza. He demonstrated that these genocidal statements were understood, echoed and acted upon by soldiers on the ground. The statements made by politicians were later graffitied by soldiers on destroyed Palestinian homes. The command to blot out the memory of Amalek was sung by soldiers before their missions and later tagged to their social media posts. Adila Hassim – a senior counsellor on the South Africa team who would later be amongst the closest interlocutors to our team – said, 'Genocides are never announced in advance, but this court has received evidence in the last thirteen weeks that shows a systematic pattern.' She then showed that Israel's conduct on the ground closely followed the declarations of genocidal intent. Israeli soldiers indiscriminately killed Palestinian civilians and destroyed most aspects of Palestinian society, civic, cultural and medical infrastructure. Blinne Ní Ghrálaigh, an Irish barrister on South Africa's legal team told the court that the 'genocide against the Palestinian people is livestreamed from Gaza to our mobile phones, computers and television screens – the first genocide in history where its victims are broadcasting their own destruction in real time in the desperate – so far vain – hope that the world might do something'.[129] The following day Israel staged its defence, claiming that 'if there were acts of genocide, they have been perpetrated against Israel'. Israeli lawyers called on the court to dismiss the case. Israel said that it was conducting a war of self-defence in accordance with international law following the Hamas-led attack of 7 October 2023.

The Genocide Convention ratified by the UN in December 1948 was based on the work of Polish-Jewish jurist Raphael Lemkin who developed the concept while the Holocaust was ravaging Jewish life in Nazi-occupied Europe.[130] After the war Lemkin lobbied for genocide to become an international crime. Only a reduced definition of the crime made it through the objections of various states which asked to write entire sections out of the convention. Imperial powers such as Britain, France, Belgium and the Netherlands were at that time in the midst of suppressing anti-colonial uprisings, and tried to frame genocide in a way that would not restrict their activities. Settler-colonial states such as Australia, the United States and Canada joined them in objecting to Lemkin's attempt to include the destruction of culture ('cultural genocide') as one of the manifestations of genocide. They knew that the destruction of the physical heritage, culture and language of Indigenous peoples was common across their colonial frontiers. Forced population transfer was taken out of the convention's draft because it was a common tool of colonial warfare and of settler colonial states such as Canada and Australia in relation to their Indigenous populations.[131] The Soviets, who were also involved in forced integration of numerous Indigenous groups, objected also to political groups being protected under the terms of the convention as this might restrict their ability to brutally crush political dissent. Southern US senators were concerned about clauses that would criminalise their policy of segregation and structural discrimination practised against Black Americans. As a consequence, the definition of genocide became narrow, making the threshold for conviction hard to achieve.

To qualify as genocide, the convention requires that acts of violence are undertaken with the 'intent to destroy a group in whole or in part, as such'. The words 'as such' demand that the intent to kill members of national, ethnic, racial or religious groups, must be attributable to the fact that they are members of these groups. This is often a big hurdle to cross as genocidal

attacks often have several aims. Israel's and other colonial genocides are often entangled with war or counter-insurgency.

Multiple statements made by Israelis with command responsibility testified to Israel's genocidal intent to kill enough Palestinians (destroy the group in part) and render Gaza unliveable so as to force the rest out. 'The historical and sociopolitical context in which genocide occurs,' UN special rapporteur Francesca Albanese wrote in her October 2024 report to the UN General Assembly, 'is key to identifying how intent forms, and then materialises' (this book shows that the geographical context is also key).[132] Indeed the elements of Lemkin's conceptualisation of genocide that were written out of the convention – the destruction of cultural, religious and historical sites, for example – were regarded by international courts as evidence of genocidal intent. The forced removal of populations was likewise written out of the convention. But what is these days often codified as 'ethnic cleansing' necessarily involves the killing of those who refuse to leave, as well as the destruction of all conditions of life in the area that the perpetrators want to empty, and thus overlaps with the crime of genocide.[133]

The convention lists five prohibited acts that, if committed with the 'special intent' stated above, may constitute genocide. The first two acts prohibit mass killing and causing serious bodily or mental harm. In Palestine, these were obviously taking place on a large scale. The last two acts are concerned with interrupting the biological continuity of the group – preventing births and forcibly transferring children into adoption.[134] Lawyers pointed to the destruction of hospitals in Gaza as a main cause of interrupted pregnancies across the Strip. Engineered starvation put thousands of pregnant and breastfeeding women into severe malnutrition. There was a threefold spike in miscarriages.[135]

The third, middle prohibition, framed as Article II(c), is most relevant for this book. It is a prohibition on 'deliberately inflicting on the group conditions of life calculated to bring about its physical destruction in whole or in part'. This prohibition refers to

indirect forms of killing. It concerns violence applied to the environment. ‘Conditions of life’ are maintained by cities and buildings, hospitals, aid warehouses, orchards, fields, access to fishing, water, sewage and electrical infrastructure amongst other things. The calculated destruction of such life-supporting infrastructure undermines a people’s ability to survive.[136]

Still despite the high threshold, on 26 January 2024 the court decided by fifteen judges to two that the positions argued by ‘South Africa and for which it is seeking protection are plausible’. The court therefore ordered Israel to take measures to protect Palestinians in Gaza from acts of genocide.[137] Despite falling short of what many hoped – that it could call for an immediate ceasefire – it offered an international recognition of the need to stop ongoing atrocities and gave credence to the call to stop the genocide. This was taken forward by activists around the world. In the wake of the hearing, international pressure mounted, and the case provided a reference point for the campaign calling for a ceasefire, prompted divestment from Israeli companies, and was a benchmark for legal cases brought in national jurisdictions that sought, and sometimes managed to delay, restrict and ban some arms sales to Israel.[138]

The prohibition of the destruction of ‘conditions of life’ is the one that lends itself most closely to an architectural analysis. That the designed and built environment is a people’s condition of life recalls the modernist conception of architecture that emerged at the turn of the twentieth century and was the prevalent conception of architecture during the late 1940s, when the convention was drafted. Modern architecture professed a form of design that was based on the constant calculation, calibration and amplifications of ‘conditions of life’. The architectural protagonists of the modern movement advocated buildings and cities designed as technical systems for the enhancement of life. Cities were laid out according to principles of public health, interweaving neighbourhoods, parks and agricultural belts. As ‘machines for living in’, modern architecture included systems for the maintenance and enhancement of biological life.[139] In his

1928 manifesto, Hannes Meyer, who would a few years later direct the architecture department at the Bauhaus, wrote in reference to Le Corbusier's conception of architecture that a building is 'a biological apparatus serving the needs of body and mind' and called for buildings and cities that would be attuned to nothing else but the calculation and enhancement of hygiene, air circulation, heat, nutrition and even sexual reproduction.[140] 'Conditions of life, calculated' can be used as an alternative slogan for modern architecture. Inversely, the destruction of architecture could be understood as the destruction of the shell without which biological life could not survive.

With its obsession with augmenting the conditions of life, modern architecture was also equipped to calculate their degradation and ultimate extinguishing.[141] Architects of my generation are familiar with Ernst Neufert, the German architect whose post-war book *Architects' Data* was a go-to when seeking the most efficient dimensions of kitchens, bedrooms, cultural buildings or park benches. In the 1920s Neufert was an assistant of Walter Gropius, director of the Bauhaus between 1919–32. Later, on behalf of the Nazi Party, Neufert oversaw the standardisation of Germany's building industry, which was largely powered by enslaved labour. Several other modern architects were involved in the design of concentration camps, notable amongst them Fritz Ertl, another Bauhaus graduate, who became a leading architect in the design of Auschwitz.[142]

Colonial Genocides

While time-intensive, industrialised mass-killing like the Holocaust – which destroyed almost two-thirds of Europe's pre-war Jewish population – took place in designated locations and in a relatively short time, killing people by destroying their 'conditions of life' can be extensive in time and space. In forming this prohibition, Lemkin was thinking about the conditions of starvation imposed on wartime ghettos, but also about five centuries of colonisation, especially in the Americas.[143]

‘Genocide has two phases,’ Lemkin wrote in *Axis Rule in Occupied Europe*, the book in which he formed the legal concept, ‘one, destruction of the national pattern of the oppressed group; the other, the imposition of the national pattern of the oppressor. This imposition, in turn, may be made upon the oppressed population which is allowed to remain, or upon the territory alone, after removal of the population and the colonisation of the area by the oppressor’s own nationals.’[144] Lemkin noted that by the end of the nineteenth century Indigenous populations in the North American plains were reduced to a fraction of their original size. While periods of intense mass killings have always been part of the process of colonisation, indirect killings have more often been the means by which Indigenous peoples were annihilated. Forced into reservations in which they were dispossessed of their ancestral habitat, separated from the environments on which they depended for food, medicine and ritual, Indigenous populations were decimated. Such reservations, purportedly instituted for their protection, were in fact intended to kill them slowly and free up the best land for European settlement.[145] Due to its ability to induce organic activity, soil is literally the condition of life unfolding on the surface.[146] The destruction of soil or the displacement of people from it is one of the clearest manifestations of the previously mentioned prohibition in the convention. Alienated from their environment, people succumbed to malnutrition and epidemics.[147] Lemkin’s conception of environmental violence is close to the definition of ‘settler colonialism’ as framed in 2006 by the Australia-based British historian Patrick Wolfe. Distinct from other forms of colonialism which seek to exploit resources or native labour, ‘settler colonialism’ aims at creating a new society on colonised territory and ‘is premised on the elimination of native societies’. Indigenous peoples are expelled or exterminated because they get in the way, or because they repeatedly attempt to return to the areas from which they have been displaced.[148]

While states tried to exclude the manifestations of settler-colonial violence from the definition of genocide, the principles

that best capture its logic and make it distinct remained in the convention as Article II(c).

This principle of settler-colonialism is clearly captured in the German concept of *Lebensraum* that directly refers to the relation between the soil and life. German geographer and ethnographer Friedrich Ratzel first introduced the concept in his 1897 book *Politische Geographie*. The word, merging *Lebens* and *Raum* – life and space – is usually translated as 'living space'. A people, Ratzel thought, is not just a political entity, but a spatial organism that must evolve in the new environments it occupies and expands into. Influenced by the US experience of westward expansion, Ratzel saw *Lebensraum* as an environmental infrastructure to sustain the biological life of the German people in their Darwinian struggle for survival. The concept spread from academia to politics, and was used by German administrators to justify Imperial Germany's programme of colonisation in Africa in the late nineteenth century. Agriculturally suitable soil was fundamental to Lebensraum. The colonisation of South West Africa (today's Namibia) provided Germany with the agriculturally suitable soil Ratzel sought. When the German colonial empire in Africa and elsewhere was destroyed in the First World War, the acquisition of agriculturally fertile soil became a leading motivation in Nazi Germany's attempt to occupy, colonise and settle territories in Eastern Europe – they primarily thought about *chernozem*, the famously rich black soil of Ukraine – with Germanic colonists. In these spaces, like in the colonial empires before them, the acquisition of *Lebensraum* was predicated on the enslavement, eviction and ultimately the annihilation of those who inhabited these soils. The making of *Lebensraum* was thus preconditioned on the production of its opposite, *Todesraum* – death space. Conditions of life necessary to support the life of some depended on their destruction for others.[149]

The Ixil Maya

In 2012 our team began assembling evidence for genocide cases

litigated in Guatemala.[150] In 2024 I was approached by the prosecutor general of Guatemala to prepare for cross-questioning on an expert report FA submitted in the trial of General Manuel Benedícto Lucas García, commander of the Guatemalan armed forces between 1978 and 1982, in the country's high court in Guatemala City. García was charged with the genocide of the Indigenous Ixil, a Mayan people who live in the mountainous area of Quiché that extends from west Guatemala to southern Mexico.[151] Historian Greg Grandin called the campaign to destroy the Ixil the last colonial genocide in the Americas.[152] García was the last living link in the five-century history of colonial conquistadors. For the Ixil and their lawyers, it was probably the last chance to receive justice.[153]

In the late 1970s, the Guatemalan military – which received training and military assistance from the US and Israel – tried to suppress an insurgency in the central Guatemala mountain area of Quiché where the Ixil inhabited small clearings within its dense cloud forest. In the process the Guatemala military targeted the Ixil Maya people, committing over 600 acts of massacre, destroying the villages and burning huge parts of the forests within which they were located. From 2012, Paulo Tavares – a former Forensic Architecture member who had since opened Autonoma, an FA-affiliated agency in Brasilia – and I travelled with a group led by Indigenous members from the Ixil community of Pexa La Grande and the forensic anthropologists of the Fundación de Antropología Forense de Guatemala (FAFG) to undertake careful mapping of the lost villages.[154] Four decades after the genocide, the forest has digested whatever organic material the buildings were made of. In the search for lost villages our hosts taught us to pay attention to particular kinds of fruit trees and medical plants. A higher density of those suggested the location of former human settlements. When we found elevated earthworks covered with fruit trees, we probed the ground to identify the harder stone foundations. Locating them allowed us to measure the sizes of houses. Near every house were others, and we could establish the size of the villages and provide a good

estimate of the number of homes destroyed and people displaced.

The foundations of an Ixil Maya home near the village of Pexla Grande, Quiché region, Guatemala. The village to which this house belonged was burnt during the genocide of 1978–1982. The ashes stimulated bush and tree growth over the ruins. The harder stone foundations of the home are still visible. Forensic Architecture, 2011.

After the villages and the forest were burnt, the entire landscape was traversed by military routes that cut the environment into enclaves. Without the environment that supplied their conditions of life, starved survivors were compelled to escape higher up in the mountains where the vegetation was sparse and temperatures low. Thousands died of hunger. Others were forced to descend to the valleys where the army provided a small quantity of aid in concentration camps – which they called ‘model villages’ – where food was rationed and all aspects of life were controlled. The destruction of the homes and villages, the burning of forests, fields and harvest, our reports showed, broke communal structures and inflicted on the Ixil conditions of life calculated to bring about their physical destruction.[155]

In the trial, cross-examination extended throughout the day. García’s defence team claimed the violence was not genocidal and

that the evidence for the environmental destruction I presented to the court was the result of a legitimate counter-insurgency operation. The forest villages were, they claimed, in fact guerilla bases. It was a similar argument to the one made by Israel regarding Hamas fighters hiding in Gaza's cities and using civilians as 'human shields'. Throughout the 500-year period of European colonisation, settlers justified the destruction of the Indigenous habitat wherever those resisting colonisation were located by presenting scorched earth operations as acts of self-defence, when the life of colonisers was in danger. The violence inflicted by the Guatemalan army, like that inflicted by the Israeli one, was genocidal because it targeted the entire group as an enemy. The principle was best articulated with an analogy made by General Efraín Ríos Montt, the president/dictator of Guatemala in 1982. Referring to a well-known quote by Mao Tse-tung regarding the way the guerillas 'move amongst the people as a fish swims in the sea', Montt explained that if 'you cannot catch the fish, you have to drain the sea'. The 'sea' was the physical and social environment, villages and forests. Even if one of the motivations of the Guatemalan army was counter-insurgent, the intent was to destroy the Ixil people in this part. Unlike the Guerrilleros, villages were static, easier to surround or occupy, their fields and houses were easy to burn, and the butchering of the inhabitants posed less of a risk than pursuing the fighters into the thick of the forests. The metaphor of 'draining the sea' in order to kill the fish was considered by the Guatemalan court to be genocidal – more so, in its intent, it was felt to capture the essence of genocide. This analogy is important to understand how the destruction and ungrounding of the entirety of the Palestinian environment is genocidal, despite Israel's claims that this was done in the name of pursuing Hamas fighters.

The Nama and Ovaherero

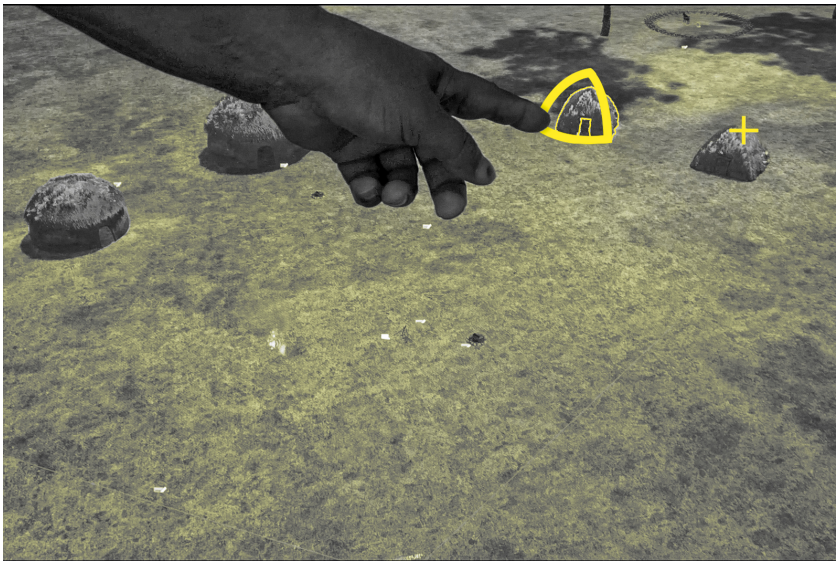
On 12 January 2024, less than two hours after Israel concluded its defence at the International Court of Justice in The Hague,

Germany announced that it would intervene as a 'third party', siding with Israel.[156] On 13 January the president of Namibia, Hage Geingob, who died shortly afterwards, rebuked Germany, arguing that it 'cannot morally express commitment to the United Nations Convention against Genocide…whilst supporting the equivalent of a holocaust and genocide in Gaza'. He added that 'the German Government is yet to fully atone for the genocide it committed on Namibian soil'.[157] Geingob pointed to a curious historical coincidence: 12 January was the 120th anniversary of events that put in motion the first genocide of the twentieth century, perpetrated by Germany's colonial army, the *Schutztruppe*. The targets were the Nama and Ovaherero peoples in a territory Germany had claimed and colonised as South West Africa. The term *Lebensraum* was only one of several precedents to the Holocaust to be put into use in the context of Imperial Germany's colonisation of South West Africa. 'Racial laws' and 'extermination orders' were others. Incidentally Heinrich Göring, the first colonial governor of South West Africa, was Hermann Göring's father.

The South African UN special rapporteur on the right to health summed up the situation: 'The state that committed more than one genocide throughout its history [Germany] is trying to undermine the efforts of a country that is a victim of colonialism and apartheid [South Africa] to protect another genocide [Israel's].'[158]

I have visited Namibia regularly over the past few years with teams from Forensic Architecture and its Berlin-based sister group Forensis. We were asked by the Nama and Ovaherero traditional leadership to support research into the German genocide perpetrated between 1904–08 in cases demanding commemoration, reparations and land restitution. Working with historical photographic archives and oral traditions we located ancestral villages destroyed, and mapped out the exact footprint of concentration camps and mass graves. Knowledge of these places existed in the memory of the communities but their exact location had been lost to time.[159]

By the turn of the twentieth century German Africa came into existence as a matrix of farms, missionary outposts, mineral and diamond mines and military forts. Colonial policy sought to restrict the Ovaherero into reservations. On 12 January 1904, fighting broke out in the town of Okahandja. More than a hundred German soldiers and settlers, mostly farmers and missionaries, were killed. For the Germans this confirmed that the Ovaherero people were savage and barbaric – some referred to them as 'baboons' – and vowed that their population in German South West Africa should be destroyed. In August 1904 an estimated 30,000 Ovaherero took refuge at the foot of the water-rich mountain plateau of Waterberg. The colonial army formed a bulwark to prevent them from fleeing towards the more fertile areas in the west and forced them eastwards into the Kalahari Desert, where many succumbed to famine or dehydration. On 2 October the commander of the colonial army, General Lothar von Trotha, issued an infamous extermination order: 'The Herero… have murdered and stolen, they have cut off the ears, noses and other body parts of wounded soldiers…The Herero people must… leave the land. If the populace does not do this, I will force them with the Groot Rohr [a cannon]. Within the German borders every Herero, with or without a gun, with or without cattle, will be shot.' German troops then rode to destroy the wells and waterholes on the Ovaherero's path.[160] Justifying expulsion as a response to atrocities – real and exaggerated – committed during a colonial uprising was echoed in Israel's response to 7 October. Sending people into the Kalahari, destroying the water infrastructure and weaponising the desert as a mode of killing, was comparable to the expulsion of Palestinians south of Wadi Gaza and beyond the 'rain line', with similar resonances in Israel's intent to expel them into the Sinai Desert. Those Ovahereros that survived did so because of their intimate knowledge of the terrain, and of where to find groundwater, just as Palestinians expelled into Gaza's southern dunes knew how to dig wells. Survivors were transferred into concentration camps where many were killed or died of malnutrition.



Mr Kaapehi, an Ovaherero oral historian, worked with Forensic Architecture/ Forensis researchers to digitally reconstruct the homestead of Chief Kambazembi at the foothills of the Waterberg Plateau. The village was destroyed and a cemetery for German colonial troops was built next to its ruins. Forensic Architecture/Forensis, 2022.

Today, the colonial-era police station at the Waterberg National Park is a restaurant for tourists, the detention room in its basement is a wine cellar. The only cemetery in the area is for the German soldiers killed when attacking the Ovaherero. Few visitors to Namibia's breathtaking landscape realise that the cemetery stands on the ruins of the Ovaherero chief homesteads destroyed in August 1904. This fact, known to local oral historians, was confirmed by a single old photograph of the village that a team at FA led by Imani Jacqueline Brown and Agata Nguyen Chuong found in the Colonial Photography Archive in Frankfurt. The distinctive rock formation in the background of the picture allowed us to confirm the location.[161]

Studying the dynamic of wind and sand, Celina Abba found the location of the concentration camp of Swakopmund buried by the drifting coastal dunes.[162] Ashkan Cheheltan, Tobechukwu Onwukeme and Mark Mushiva reconstructed Shark Island – a windy and exposed rock protruding into the South Atlantic in the

port of Lüderitz – where Ovaherero and Nama captives were starved, beaten, raped and executed. The place, which functioned itself as a tourist camp, was about to be destroyed by the expansion of a port designed to facilitate the export to Europe of green energy. Our evidence is currently being presented in legal processes, brought about by our partners, in an attempt to preserve this location.[163]

Working on the colonial genocides in Namibia and Guatemala while the Gaza genocide was unfolding provided our team with necessary comparative perspectives.[164] Our report prepared for the *South Africa v. Israel* case in The Hague included historical references to the points of similarity between these cases and events in Gaza.

The unknown location of colonial-era photographs was established by matching the unique rock formation of the Waterberg Plateau, as recorded in archival images (sepia), within a digital model of the contemporary terrain (grey scale).

The ‘image match’ of the Kambazembi homestead agreed with testimonies of Ovaherero oral historians Mr Kaapehi and Mr Tjitavi. Forensic Architecture/Forensis, 2022.

The Case

In early 2024 Forensic Architecture started working closely with the South Africa legal team, providing reports for their ongoing submissions. The project is led by Nour together with Omar Ferwati and Davide Piscitelli, and a group that at times grew to some twenty other researchers. The reports were based on a large database the team at Forensic Architecture gathered from October 2023. We collected and analysed videos and recorded testimonies found online or sent to us from people we knew in Gaza. We watched, listened and read heartbreaking accounts of pain and cruelty. Each testimony described the experience of displacement, loss, a bombing, shooting or an act of demolition, each was a harrowing story of the destruction of a different aspect of Gazans’ lives and livelihoods. Each was a cry to end the genocide. Each video was also a historical and potentially a legal document, a molecular unit in the building of a genocide case that was unfolding. The numbers of testimonies, videos and audio files grew from one week to the next: from hundreds, to thousands, to tens of thousands, which we processed through a careful process

of verification and analysis.

Videos found on social media are stripped of their 'metadata' – which include encoded information about the place and time the recording was made. Locating each incident to where and when it took place is essential for its presentation in legal contexts. This involves establishing the camera's cone of vision by comparing visible features in the video with those seen in satellite images. This process, often known as 'geolocation', became – as noted in the introduction – increasingly difficult as recognisable features were systematically destroyed and as the indistinct, ungrounded surface expanded. We often have to reconstruct the exact time an image was recorded by finding physical time indicators within images, for example studying the shadows of a building, which are specific to every date and time. Clouds, whether natural or those raised after bombs, evolve in unique shapes. When the shape of a cloud in one video matches that in another, we know that the videos are synchronised. Almost every image of the skies over Gaza had bomb clouds.

There is a huge contrast between the indescribable pain, rage, disbelief we felt at what we were watching, between the chaos and confusion of the experience of an ongoing genocide that the testimonies and the videos tried to convey, and the legal necessity to calmly collect, classify and catalogue evidence; between the unspeakable, un-showable, incomprehensible, and the need to watch devastating images, analyse, demonstrate and speak to atrocities we have not experienced ourselves. Ours was a desperate, often Sisyphean attempt to document as much as we could, to carefully and attentively look at each of tens of thousands of incidents and try to understand its relation to others.

An archive needed a cataloguing system. Its technical nature only amplified the horrors behind the numbers. Incident 31106-91297 occurred on 10 March 2024 when an Israeli soldier killed Atta Ibrahim al-Muqayad, a deaf and mute seventy-three-year-old Palestinian, inside his home in Gaza City. Incident 31112-93909 occurred on 12 November 2023 when the Israeli military shot Hala Khreis, a Palestinian woman attempting to

evacuate with her grandson, while holding a white flag. Incident 00000-73965 is of Palestinians killed near Shuja‘iyya on 5 April 2024 when they tried to collect an aid package. An air strike on the al-Mawasi humanitarian zone on 10 September 2024 in which nineteen civilians were killed was classified as incident 40910-91667. Incident 00000-73968 shows wounded patients trying to evacuate the Nasser Hospital in Khan Younis. Incidents 31204-83772, 31204-06603 and 31204-67873 describe Israeli air strikes on areas shortly after they were designated ‘safe’. Incident 31124-80389 was filmed on 24 November 2023 and shows the remains of long-dead civilians – likely eaten by dogs – scattered along the ‘safe route’ of al-Rashid Road (these were likely the same bodies seen by the couple whose multiple displacements we documented previously). Incident 40702-18619 described the killing of Dr Hassan Hamdan, along with twelve members of his family after they followed an Israeli evacuation order and left Khan Younis for their relative’s home in Deir al-Balah. Incident 31009-64406 is the 9 October 2023 air-force strike on the International Eye Hospital in Gaza City. Incident 31013-47741 is the 13 October 2023 attack on the Muhammad al-Durrah Children’s Hospital. Incident 31116-93455 is the blast in al-Ahli Hospital discussed extensively earlier. Incident 31028-91205 is the 28 October 2023 attack on the Indonesian Hospital. Incidents 31010-25053, 31009-21939, 31010-42259 are strikes on the border terminal in Rafah that sealed the border with Egypt. Incidents 40411-71948, 40417-21879, 40411-27955, 40820-63679 and 40411-25044 are attacks on Palestinians trying to buy food in the few improvised markets of Gaza City. The ceremonial destruction of the Rafah municipality building by an Israeli unit is recorded as incident 40507-91680. Incident 40903-59006 is the destruction of the minaret of the al-Huda Mosque in Rafah. Incident 40224-39086 is the complete destruction of the al-Saqqa Mosque. Incident 40604-83642 is the crushing of dead bodies by tanks outside the destroyed University College of Applied Sciences. Incident 40114-78720 describes the ceremonial demolition of al-Israa University, shortly after the no-

less ceremonial demolition of the legal court complex known as the Palace of Justice on 14 January 2024, which was catalogued as incident 31204-19472. Families digging to find the remains of relatives in al-Shifa following the withdrawal of the Israeli military is incident 40401-01505. Incident 50405-36676 is the 5 April 2025 airstrike on the al-Khair communal kitchen in Khan Younis where three workers were killed; incident 50502-20935 is the 2 May 2025 strike on the communal kitchen in Gaza City where six people were killed; incident 50504-85112 is the 4 May 2025 airstrike on a field kitchen in Nuseirat where many were injured. Incident 50529-61232 is the 29 May 2025 airstrike on a crowded makeshift market in the al-Rimal neighbourhood of Gaza City, killing eleven Palestinians. Incident 50630-96357 is the 30 June 2025 airstrike on al-Baqa Café – a popular beachfront meeting and co-working spot for young professionals in Gaza – which killed forty-one people, including visual artist Amina al-Salmi and photojournalist Ismail Abu Hatab, and injured around seventy-five others. Incident 50531-15369 occurred on 31 May 2024. It shows people collecting flour scattered on the ground near the al-Tahliya roundabout in Khan Younis. One of the women, overwhelmed with frustration, flings the flour into the air. Mixed with sand, the flour is unusable. Incident 50603-81250 shows an armed gang stealing aid on 3 June 2025 in Rafah. Incident 50612-21943 occurred on 12 June 2025 when Israeli snipers shot people waiting outside a food ration station.

Once an incident is archived, we plot it on a constantly evolving digital map we called 'A Cartography of Genocide'.[165] The map included a collection of thousands of verified accounts and incidents detailing, blow by blow, the destruction of life in Gaza arranged according to different categories: the destruction of the healthcare system, public infrastructure, homes, agriculture, the enforced displacement of Palestinians and Israel's attacks on aid workers. The cartographic digital map allowed each of these atrocities to be looked at individually or in relation to others and to demonstrate how different instances of violence acted in concert, each amplifying the effect of another.

International tribunals dealing with cases of genocide have in the past ruled that genocidal intent can be inferred not only from official statements made by political or military leaders – which in the case of the Gaza genocide existed aplenty – or explicit commands given to the army – the latter are very hard to come by – but also from the pattern of conduct of the forces on the ground.[166] Patterns denote the repetition of similar or related incidents, at different times and places.

Israel's default justification of the level of killing and destruction was that it was the consequence of military encounters with Palestinian fighters in an evolving battlefield. If this was the case, incidents would be randomly scattered on our map. Looking at the relation between the incidents our map revealed, however, the regular repetition of similar types of actions – for example, targeting of aid efforts, destruction of medical infrastructure or agriculture – by different units, in different parts of the Gaza Strip and at different times throughout the past two years. This pattern demonstrated 'widespread and systemic' violations, a manifestation of a plan, an organised and designed campaign to destroy Palestinian life in Gaza.

Our cartographic platform showed the relations between incidents. Different patterns emerged across our aggregate data. The relation between a large multiplicity of separate incidents demonstrated that different atrocities perpetrated simultaneously amplified the harm created by others, so that the cumulative result was larger than the sum of its parts. The platform showed that the destruction of homes, public infrastructure and medical facilities coincided with evacuation orders sending Palestinians from their homes into concentration areas. This dislocation was in all cases followed by systematic and total ungrounding of agricultural areas, denying Palestinians the ability to produce food locally. It was at the same time, our platform showed, that the Israeli army attacked aid infrastructure. The compounded result of destruction of local and imported food was the engineering of starvation.

The process of verification involves also checking the

authenticity of all videos. A fake video will not synchronise with others taken at roughly the same time and space. Despite all talk of AI-generated 'deep fake' images, the most common manipulation involves using videos taken in different places, sometimes from completely different conflicts and attributing them to current events. Another common manipulation is misleadingly annotating a real video. Omar and Davide carefully reviewed the visual material that the Israeli legal team presented in their defence against the South African petition on 12 January 2024 at the International Court of Justice in The Hague. We found several instances where they misrepresented images through a combination of inaccurate annotation and misleading labels. One of the images they submitted to the ICJ in their presentation of 12 January 2024 showed an armed Palestinian fighter in a street corner. On the image the Israeli army – possibly members of the 'legitimisation cell' mentioned earlier – drew a boundary line, labelling it al-Quds Hospital, in a way that suggested that the fighter was inside hospital grounds. Another image showed the smoke trail of a rocket he fired. This still had the caption 'RPG launched at our forces from al-Quds Hospital'. These images, the Israeli legal team suggested, justified the targeting of the al-Quds hospital, and by extension, others. However, by studying the architecture of the hospital, looking at many other videos and images and speaking to local medical staff, we established that the Israeli team had drawn the boundary of the hospital in a misleading way. The fighter was outside the hospital. In another example the Israeli legal team presented a satellite image with a small circle labelled 'Hamas rocket launch site' close to a water-desalination facility. Their caption read 'Hamas prefers launching rockets at Israel rather than fresh water for Gazans'. We found that the feature they highlighted was rather a crater caused by an aerial bomb they had themselves dropped near the facility.[167]

At the end of October 2024 South Africa's legal team submitted a long written report to the International Court of Justice known as a 'memorial', detailing their case. Much of the evidentiary basis

for their legal arguments was an 827-page report produced by our team at Forensic Architecture and titled, rather dully, 'A Spatial Analysis of the Israeli Military's Conduct in Gaza since October 2023'.[168] This evidentiary work was also used in other legal contexts, particularly those challenging Israel's arms exports.

Hind

One of the incidents we studied was unspeakably horrifying. On 29 January 2024 a five-year-old Palestinian girl, Hind Rajab, was killed along with her four cousins, aunt and uncle, and the two paramedics from the Palestine Red Crescent Society (PRCS) who attempted to rescue them. The world knows about this story because the PRCS recorded the phone conversations they had with Hind and her cousin Layan Hamadeh before and while they were shot at. Many other no-less horrifying stories will remain unknown. For months after the incident took place, Forensic Architecture worked with Sharif Abdel Kouddous of Al Jazeera to investigate and tell the story in full in a film called *The Night Won't End*.[169]

On 29 January 2024 the army ordered residents of the Tel al-Hawa neighbourhood in central Gaza City to evacuate southwards. An arrow drawn on a map attached to the evacuation order posted online pointed south of Wadi Gaza. The family decided to travel in different groups, a choice forced on many families who wanted to increase the chances of some to survive. Wissam Hamadeh, Hind's mother and other family members fled on foot. Hind's uncles took the children in the small family car, a Kia Picanto. They tried to drive south but could not – likely because, we noticed, the road was blocked by debris from a recently bombed building. They tried to drive around the block. Several Israeli tanks were located further up the road the family took. We could notice these tanks in a satellite image from the day. One of these tanks fired on the family's car from its mounted machine gun, killing all the passengers in the car, except for Hind and her fifteen-year-old cousin Layan. Around 2.30 p.m. Layan

managed to call a relative in Germany, who contacted the Red Crescent headquarters in Ramallah. A call-centre operator immediately rang the two injured girls. The conversation lasted about twenty seconds:

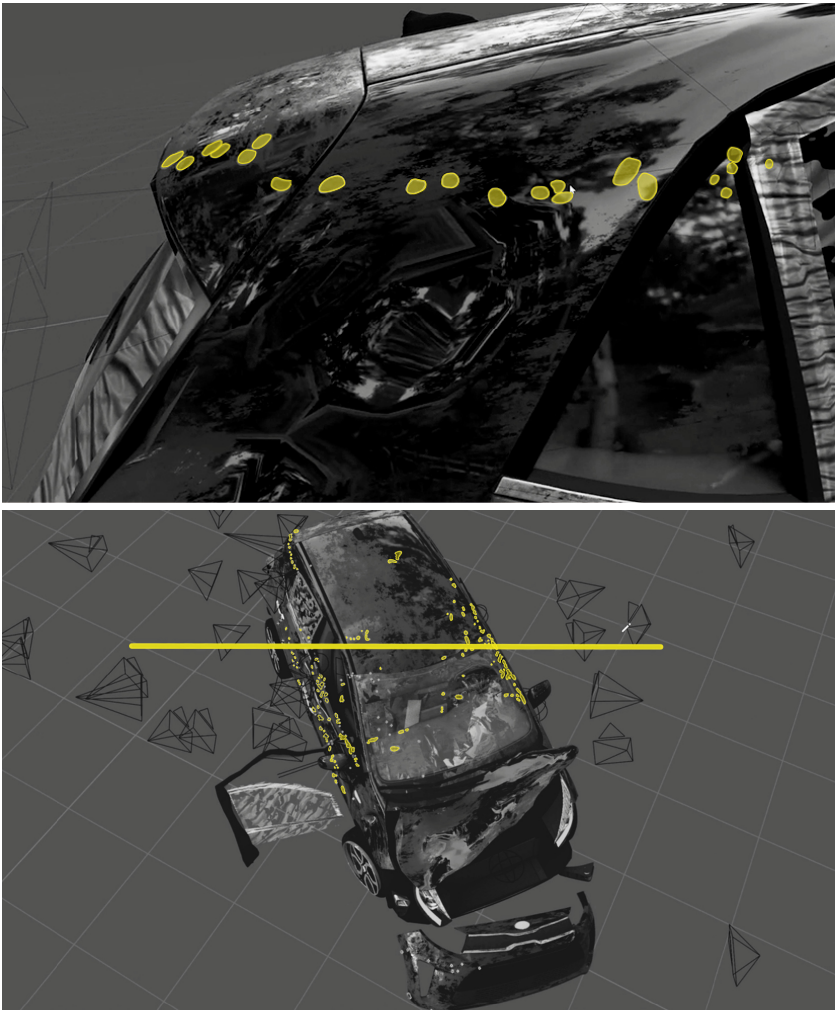
> Layan: Come help us. They are shooting at us. The tank is next to me.
> Operator: Are you hiding?
> Layan: Yes, we are in the car. The tank is next to us.

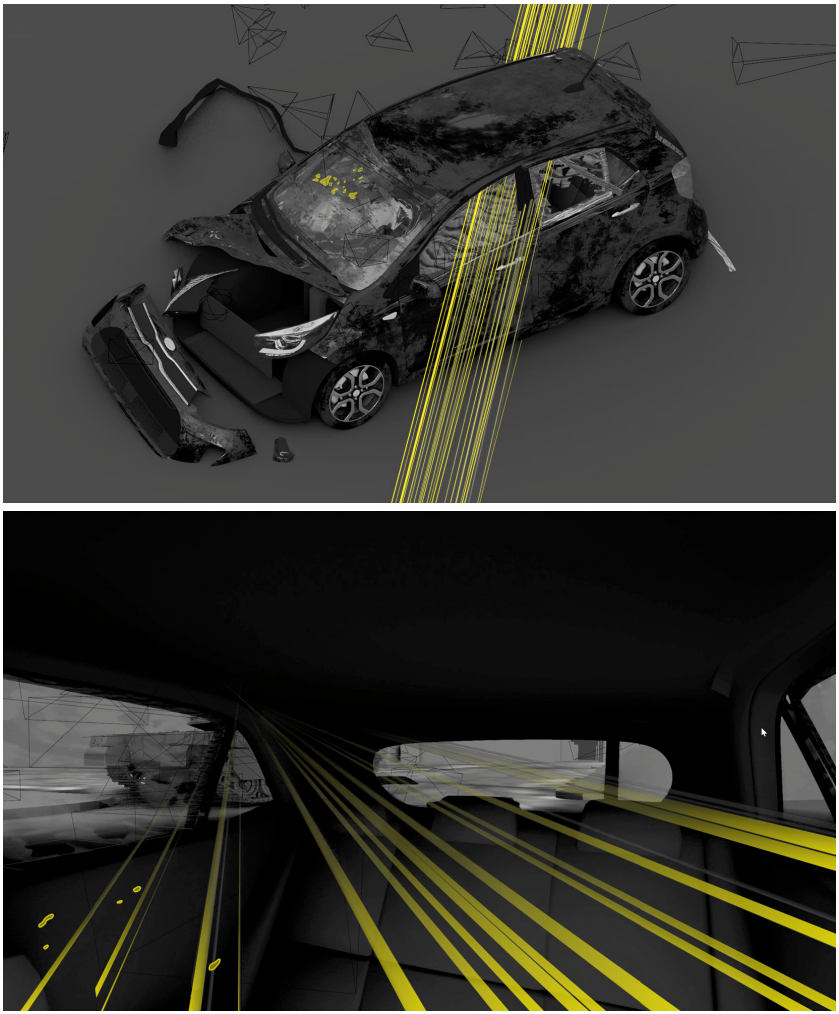
The exchange was then interrupted by a six-second burst of machine-gun fire. The line falls silent. Earshot, our frequent collaborator with whom we worked on this case, counted the sound of sixty-four bullets in this burst. The recording captures Layan's blood-curdling screams. The screams stop abruptly. The operator continued: 'Hello? Hello? Hello?' Layan was killed immediately but Hind remained alive though wounded. The shots – audio and spatial analysis showed – were fired from no more than thirteen metres away from the car. From this distance the shooter could not have missed the fact that the survivors were children. Hind remained from then on the only person alive in the car. The PRCS dispatchers made and maintained intermittent contact with her via phone.

To access the site the PRCS headquarters required the army's permission, but it was not granted. The medics spoke to Hind for over three hours while she was surrounded by her family's dead bodies. The conversation was recorded in full.

At one point, the PRCS workers connected Hind to her mother. 'I miss you,' the frightened Hind said time and time again. The five-year-old girl, surrounded by six of her dead relatives, told her mother that she was hungry, thirsty, cold, that she was wounded and bleeding. The words 'I'm so scared, come, please. Come and take me. Will you come and take me?' were Hind's last words to her mother. Later Hind spoke to the Red Crescent control centre. She told them she no longer wanted to speak because her mouth was bleeding. She did not want to wipe it with her sleeve and

trouble her mother with cleaning it. This is the last thing she said before her voice disappeared.





A model of the Kia Picanto in which the bodies of Hind Rajab and her six relatives – Rima, Yasmeen, Layan, Bilal, Alaa and Ahmad Hamadeh – were found. Forensic Architecture identified 355 bullet holes on the car and established the direction of fire. Earshot and Forensic Architecture, 2024.

The army granted access for the ambulance at 5.40 p.m. and the ambulance managed to reach the site at about 6 p.m.

> Control room: Can you see the car?
> Ambulance: I can't see a thing here.
> Control room: Do you have your siren and flashing lights

on?
Ambulance: Just the lights, not the siren. Oh there it is.
[sound of explosion][170]

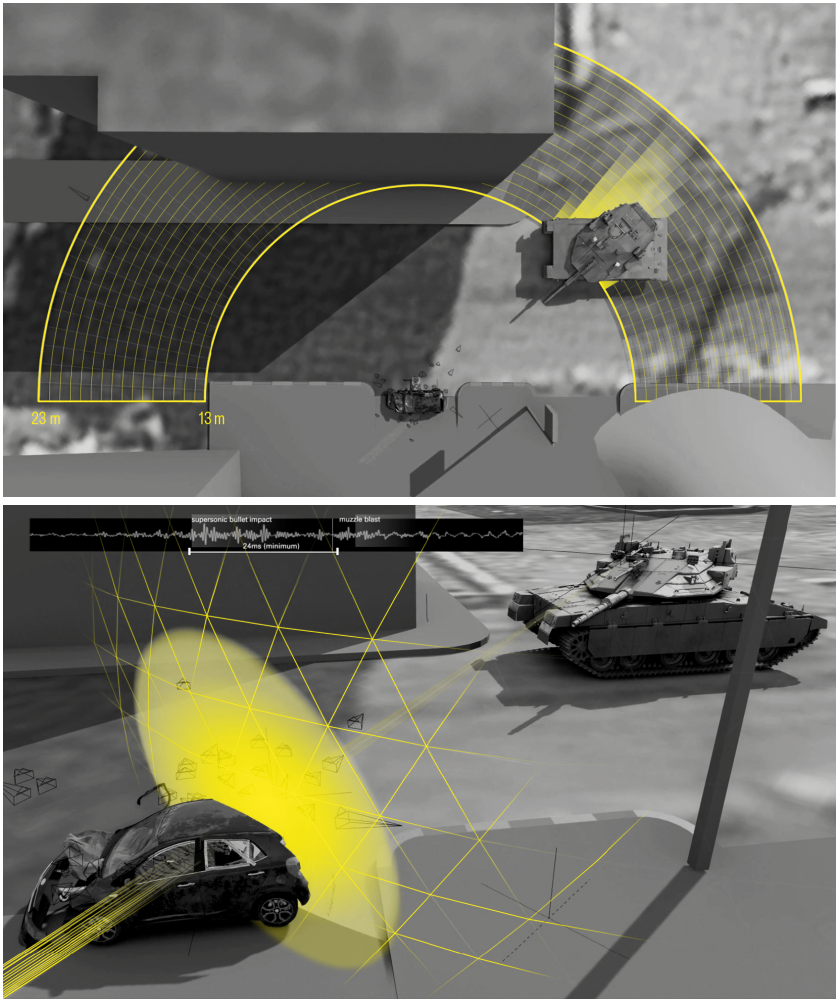
Two weeks later, on 10 February, the bodies of the two paramedics, Yusuf al-Zeino and Ahmed al-Madhoun, missing since 29 January, were discovered in the ambulance about fifty metres away from the car. Images from Al Jazeera showed the entry and exit holes of the tank shell. Hind's body was found in the car alongside those of six of her family members. The vehicle was documented by a journalist named Dawoud Abo Alkas following the withdrawal of Israeli forces from the area twelve days later. Samaneh and Nick Masterton at FA counted a total of 335 bullet holes on the Kia Picanto and established the direction of the shooting.

During the days that followed, the army gave several contradictory accounts of the incident. At first, they claimed they were not near the scene at all. Later, after being confronted by evidence, the army said that the matter was being examined by senior officers. This was the army's usual playbook of denial and deflection. To date, the army has not released any information about their examination, despite the White House being confronted time and again by journalists using our report.[171]

About a third of those killed in Gaza are children. Seventeen thousand newborns, babies, toddlers and children were killed by explosions, shots, suffocation, being buried alive, starvation, dehydration and burning. In the many videos from Gaza, children are seen shaking. The Gaza Strip has the highest incidence of child amputees of any place in the world. An international foundation was established in Hind's name. It is based in Brussels and aims to promote the prosecution of Israeli soldiers.

On 29 February 2024 the number of officially recorded dead crossed 30,000. Aid agencies reported a looming famine. On that day at least 118 Palestinians were killed and 760 injured after Israeli forces opened fire while the starved Palestinians were approaching aid trucks on the coastal al-Rashid Road south of

Gaza City, shortly after the trucks were allowed to cross the Netzarim corridor into the forbidden zone. A month later, on 1 April, Israeli drones fired missiles at the World Central Kitchen convoy killing seven aid workers on the same road. These were the most widely reported attacks on aid, but our team closely documented hundreds of others. In their wake and under US pressure Israel started to permit higher volumes of aid trucks to enter Gaza.[172]



Audio analysis by Earshot established the approximate distance of the tank-mounted machine gun from the Kia. Combining this distance with the direction of the bullets

allowed the joint team to pinpoint the most likely position of the tank when it shot at the passengers in the car. From this position and distance, the soldiers could have seen the children in the car. In their technical precision, these details reflect some of the horror of this atrocity. Earshot and Forensic Architecture, 2024.

Design by Destruction

In the early months of the war, destruction was so omnipresent that it seemed random. Since October 2023, Gaza has been both a demolition zone – where all life-sustaining infrastructure was destroyed – and a construction site – where Israeli bulldozers and other logistical vehicles rearranged the rubble made by its destruction into a new military architecture of earth berms. Plotting all acts of destruction on our platform we gradually started to notice a consistent and clear spatial plan coming into being. Day by day the lived architecture of Gaza disappeared, and a new set of architectural forms appeared through the rubble (see map on this page).

The overarching strategic planning of military infrastructure takes place in the army's General Staff's Technology and Logistics Branch. The army's Combat Engineering Corps' 'Infrastructure Branch' – equipped with a range of heavily armoured Caterpillar D9 bulldozers, armoured excavators, compactors, trucks and wheeled loaders – is tasked with smaller-scale architectural design and implementation.

Forward logistics centres, large enclosures surrounded by long berms, were established from the destroyed neighbourhoods of Gaza City and deep inside Khan Younis. They were served by underground fuel and water pipes and overground electricity cables. A seawater desalination plant provided fresh water. Supplies – including dozens of tons of explosives of various types – arrived by armoured trucks but, as some of those were fired at by small rockets leading to huge explosions, explosives were delivered by large quadcopter drones running a constant airlift. Bulldozers were always in short supply. Israel sought to buy more D9 bulldozers from the US, but these were held back by the Biden administration and were only sent after Trump came to power.

The army was forced to rent unprotected bulldozers from the private sector.

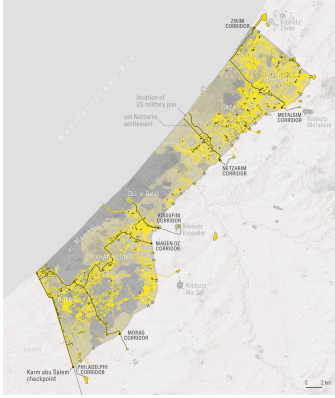
Between the forbidden zones and the concentration areas the bulldozers erected barriers of piled rubble. The barriers were punctured by fortified checkpoints which offered a one-way connection from the north to the south.[173] The checkpoints were remotely operated, equipped with facial-recognition technology able to register everyone passing through. This was an attempt to extend the biometric database of all Palestinians in Gaza, identify wanted people, and possibly the captives and hostages. These sensors ended up misidentifying many Palestinians, leading to their arrest, interrogation and torture in more than a dozen Israeli prisons in the Negev where inmates were subjected to arbitrary violence, rape, deliberate starvation, sleep deprivation, humiliation and denial of adequate medical treatment.[174]

Leading out from Israeli military bases outside Gaza were fifteen new military routes. They crossed the fences and the buffer zone with their path of destruction continuing straight into the built fabric of Palestinian cities and camps (see image on this page). These routes were meant to facilitate repeated military incursions. Every building in a wide margin around them was flattened.[175] Along these routes, the bulldozers piled soil and rubble to create barriers and more military outposts.

By the summer of 2025 five of these fifteen routes became what the army called ‘corridors’ – wide routes crossing the Strip east to west, from the perimeter fences to the shoreline. The corridors were designed to create internal wedges that bisect the Strip into slices and functioned in a similar way to the roads stringing together the Jewish settlements in Gaza that Ariel Sharon advocated in his ‘five-fingers plan’ of the early 1970s (see Part II). The names of the corridors and their location suggested that Israel was entangling the military occupation with a civilian one. The northernmost Mefalsim Corridor was named after a kibbutz settlement outside Gaza that was attacked on 7 October 2023. It separated the northern part of the Strip, including the

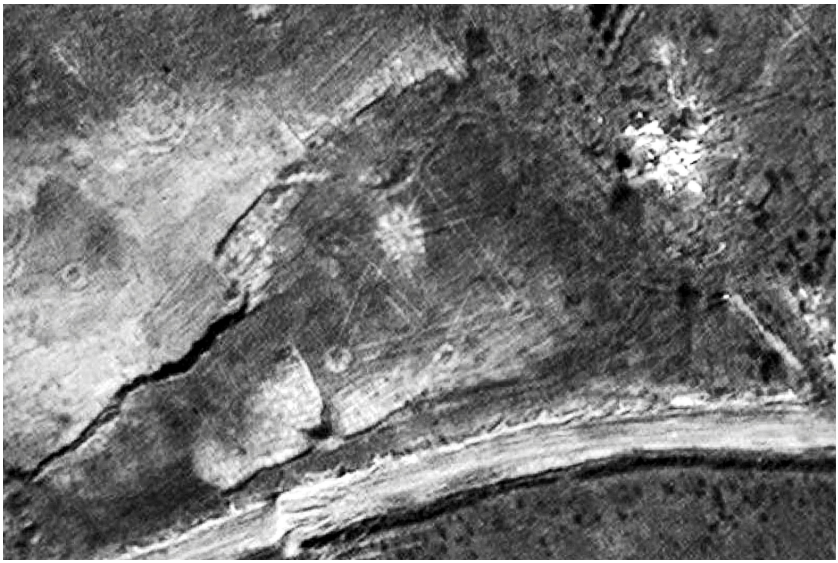
camp of Jabalia and the towns of Beit Hanoun and Beit Lahiya from Gaza City; the Netzarim Corridor along Wadi Gaza was named after the Netzarim settlement constructed in that place in Gaza in 1972 and separated Gaza City from the centre of the Strip; the Kissufim Corridor, named after a kibbutz settlement outside Gaza that was attacked on 7 October 2023, separated the centre part of Gaza from Khan Younis; the Magen Oz Corridor, referring to the kibbutz settlement of Nir Oz outside Gaza, cut through Khan Younis; the Morag Corridor, named after a Jewish settlement constructed in this place inside Gaza in 1970, separated Khan Younis from Rafah; the expanded Philadelphi Corridor sealed the Strip from the south, separating it from the Egyptian border (see map on this page). The distribution of the military outposts along the corridors was done in such a way that they could turn into civilian settlements. This fact was recognised by the settlers who tried to break into Gaza and inhabit the outposts.

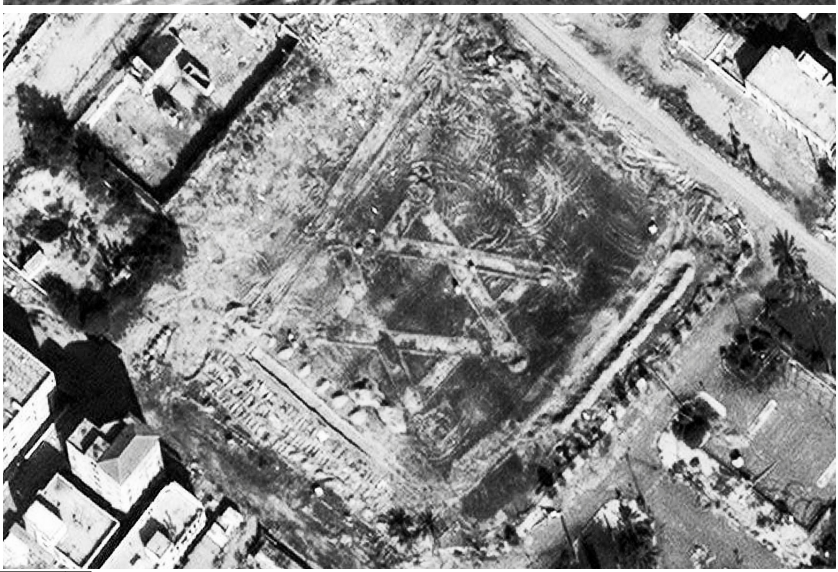
In January 2024 the largest of the militarised corridors – the Netzarim Corridor along the northern bank of Wadi Gaza – started to be paved as a straight highway, 6.4 kilometres long from the fences to the shoreline. On both sides of the highway Israeli bulldozers piled mounds of rubble and earth three to four metres high, to protect vehicles from sniper fire. Four large enclosures – each more than a hundred metres in length – made of rubble piled some six metres high, were placed at intervals along the highway. Within these massive enclosures, bulldozers piled lower mounds, dividing the outposts into different sections: parking for tanks and heavy vehicles and soldiers' accommodations. Command centres were placed in prefabricated, air-conditioned caravans. At the end of the road, in April 2024, the US military attached a floating pier meant to dock boats arriving with humanitarian supplies. The floating pier was dismantled in July 2024, when it became clear it was unable to withstand the Mediterranean waves, but the fact it was put in place near Israeli military infrastructure demonstrated the extent of US involvement in the campaign.



Ungrounded surfaces (yellow), tank paths (thin yellow lines), and military corridors (thick black lines) made by the Israeli army by October 2025. The army did not fight in space, but transformed space as an act of warfare. Forensic Architecture, 2025.

Over the first year the Netzarim Corridor thickened. Bulldozers and sappers flattened three to four kilometres on each side of the road, roughly thirty-five square kilometres, about 10 per cent of the total size of the Gaza Strip. We followed day by day as some 600 structures were destroyed and all agricultural fields and orchards were ungrounded. Within this area we recorded the destruction of the al-Ummah University, the University of Palestine, the faculty of medicine of the Islamic University of Gaza, and the faculty of law of al-Azhar University. The al-Israa University was blown up on 14 January 2024, two days after the International Court of Justice heard the genocide case brought by South Africa against Israel. Two parks, a courthouse and a wastewater treatment facility were likewise demolished. Only parts of the ‘Turkish hospital’ and a few buildings requisitioned and appropriated by its units for military headquarters, remained standing.[176] They too would be destroyed in early 2025.





Satellite images showing Stars of David carved by bulldozers onto the surface of Northern Gaza (top) and Gaza City (bottom). Esri World Imagery, 2024.

When the Netzarim settlement was evacuated in the autumn of 2005 under Sharon's government, every building in it was

destroyed. A large menorah was taken from the roof of its synagogue by the evacuating settlers and placed in front of a small commemorative museum in Jerusalem. The Turkish–Palestinian Friendship Hospital was built after the 2005 evacuation on the settlement's footprint. In late 2023 the hospital was evacuated and turned into a permanent military base and the command headquarters of the Israeli invasion.[177] The site also became the focus of the settler movement which started making plans for the rebuilding of the Jewish settlements on Gaza's ruins. Outside the fences, settlers gathered with dozens of mobile homes, waiting to enter. Settlers didn't in fact need to break into Gaza, they were already in as soldiers. Soldiers affiliated with this movement carried the menorah back into Gaza and installed it at the place the synagogue stood until 2005.[178]

Whereas during the thirty-eight years of ground occupation (1967–2005) the twenty-one Israeli settlements inside Gaza were inserted as wedges in between Palestinian population centres, the renewed settlement plan sought to extend over the entire territory of the Gaza Strip, to be made available to the settlers after Palestinians were to be forcefully expelled or killed and all Palestinian cities were to be ungrounded.[179] Daniella Weiss, the vocal leader of the settler movement, called for stopping all food and humanitarian aid to make Palestinians 'want' to leave.[180] The settler movement revealed its settlement map in January 2024. Stars of David were drawn over Beit Hanoun, Gaza City, Deir al-Balah, Khan Younis and Rafah, denoting new Israeli towns. It was around the same time that several huge Stars of David were carved by bulldozers onto the pulverised ground in the centre of Gaza City.[181]

Buffer

The first buffer zone around the Gaza Strip was put in place in 1949. It was roughly three kilometres wide on the Israeli-controlled side of the armistice line. The standing orders for the Israeli army and settlers was to shoot at anyone crossing into it.

After 1967, when Israel occupied Gaza, it flipped the buffer zone to the other side of the fences. Until October 2023, the buffer zone was a few-hundred-metres-wide strip all along the fences. In it the army destroyed every structure and uprooted every plant. The ungrounded surface was meant to expose Palestinian bodies to Israeli snipers before they could reach the fence. Palestinians entering this buffer zone, like the original one, would be shot. In the decade before October 2023 thousands of Palestinians, mostly unarmed, were killed or maimed there. Two weeks after the start of the war, on 21 October 2023, the Israeli army announced the expansion of the buffer zone to 1,000 metres, some fifty-five square kilometres. From then on it rolled into Gaza like a tide. Wherever it extended, the area was ungrounded. Like all previous buffer zones anyone entering it was shot.[182] Destroying anything within the buffer zone as fast as possible became a competition between engineering units.[183]

The ungrounded surface of the buffer zone expanded over much of the cultivated agricultural lands, which were mainly on the loess and clay soil in east Gaza along the perimeter fences.[184] In the north of the Strip near Beit Lahiya, farmers cultivated strawberries, the majority of which, when permitted, were for export to the West Bank and Jordan. Gaza's citrus orchards – mainly oranges and grapefruits – were cultivated east of Beit Hanoun in the north-eastern corner of the Strip; many of Gaza's lemon orchards were east of Khan Younis. The fields of Wadi Gaza produced cash crops such as radishes, sweet potatoes and soybeans. In greenhouses east of Rafah, Palestinian farmers cultivated tomatoes, cucumbers, aubergines, courgettes, sweet peppers and chillis.

We followed the destruction of vegetation in these zones from testimonies, videos and satellite images. The pattern of destruction was methodical and systematic. The Strip's food basket has gradually emptied. By October 2024 we documented almost 4,000 greenhouses destroyed. All orchards were shaven off. By the end of 2024, 96 per cent of cattle had been killed, milk production halted, 95 per cent of sheep and goats and 99 per cent

of poultry in Gaza eliminated. By April 2025, more than 80 per cent of farmland was destroyed. Satellites able to register vegetation activity showed a month by month decline until almost all plant life died out. Israel had turned the most agriculturally active part of the Strip into a desert.[185]

Environmental destruction in the buffer zone extended from the surface to the subsoil beneath. Pipework in the shallow subsoil was cut by the bulldozers and wastewater bled out. Without fuel, sewage facilities spilled millions of litres onto the exposed surface, which from there made their way into the subsoil.[186] Millions of tons of rubble and garbage have accumulated in informal dumpsites. When buildings are bombed or bulldozed, their pulverised remains release toxic chemicals into the soil: metals, fire contaminants and asbestos. When they explode underground, bombs release heavy metals like uranium, lead and arsenic. Many of these substances are slow to decay and will for decades affect the physical, chemical and biological composition of the soil, removing conditions necessary for life, well into the future.

Israel said that a larger buffer zone was necessary to protect the first-line kibbutz settlements outside Gaza (which were themselves put in place as a line of defence), to expose tunnel shafts and to give the army a logistical depth inside the Strip. However, the creation and gradual expansion of the buffer zone was not only tactical but consistent with Israel's genocidal aims. It removed Palestinians from their agricultural land and pushed them towards the coastal dunes. The ungrounding of the buffer zone thus became a major element in the engineering of starvation. It is analogous to Guatemalan president Efraín Ríos Montt's genocidal principle of 'draining the sea to kill the fish', with the distinction that in Gaza the draining of the sea was made in preparation for the developing of the 'reclaimed' land.

Tunnels

The Israeli army was encountering stiff resistance, much of it

blamed on the tunnels. In the beginning of 2024, as it started encountering Palestinian guerilla warfare, the army updated its assessment as to the total length of tunnels, which it increased from 500 to 700 kilometres. It claimed that the Hamas leadership, including Yahya Sinwar, was hiding in tunnels under Khan Younis.

The army searched for tunnels using ground-penetrating radar. However, as mentioned earlier, detection was made harder because the iron bars in the rubble distorted the signals. Information on most of the tunnels that were eventually found came out of tortured interrogation of Palestinian captives. With every discovery of a tunnel shaft the army's digital map was updated and presented more possible routes. Israeli soldiers were wary of entering the often booby-trapped tunnels, preferring drones, robots or dogs mounted with cameras. But drones lost the signal and dogs were killed by the tunnel defenders. The army reverted to old tactics, sending in Palestinian captives as human shields.

Firyal Safi, a forty-eight-year-old mother of eight from Gaza City, recounted how on the morning of 5 February 2024 the army took her son Abdallah to serve as one such human shield. The family was in their living room in one of the upper storeys of their building when they saw an excavator bulldozer breaking a hole in the external wall, through which, a few moments later, flew a quadcopter with a loudspeaker. A voice ordered the family to strip. Another drone flew in to film them. The first drone then ordered men and women to separate. It hovered in front of Abdallah and ordered him to tie up all the other men in the family. Followed by the drone, Abdallah was then ordered to go into the basement of the house as the drone searched for tunnel shafts. Other testimonies delivered by Israeli soldiers and Palestinians describe men forced to dress in Israeli army uniforms. Fitted with body-worn cameras and flashlights, tied to long ropes, they were sent into tunnels ahead of the soldiers. They were referred to as *shawish*s, a Turkish word borrowed into Arabic meaning a low-ranking servant. A soldier told Israeli media that

captured Palestinians were promised that if they performed a single tunnel mission – which were dangerous as Palestinian defenders would obviously shoot at uniformed men moving towards them – they'd be freed. One spin of Russian roulette was their only way to freedom. The movement of the Palestinian captive ahead of the forces was monitored via the bodycam while the soldiers held on to the end of the rope. A soldier who watched such footage said he 'could hear deep breathing, it sounded like he was a bit scared…They simply sent him in and he mapped it out.' Another soldier said that rather than set them free, soldiers sometimes casually shot their surviving *shawish*s after they had performed their task. Others were released and recounted the ordeal.[187]

As they mapped the underground network, intelligence officers said they were surprised to realise that the system was not only much larger, but more interconnected than they initially imagined. They claimed small tunnels drained into larger ones, and relatively shallow ones, some twenty metres deep, connected through hidden trap doors to deeper branches, some as deep as forty metres which in turn led into different tunnels that the army said went as deep as seventy metres. Dan Goldfus, the Israeli general who commanded the invasion of Khan Younis, and was considered by the Israeli military as a specialist in tunnel warfare, told Israeli media that 'It's all one large network; you can enter it at the Erez Crossing and emerge in Rafah. Everything there is connected to everything.'[188] This was crass propaganda likely meant to justify the total destruction of the surface and his forces' inability to subdue Hamas's guerilla war. Israeli troops did manage to discover some air-conditioned command-and-control centres in some places as well as stocks of documents and money, but Hamas fighters avoided direct firefights underground, they simply 'evaporated'. Locking the heavy steel blast doors installed in internal recesses of the network gained them enough time to escape when they heard soldiers or human shields entering. The army claimed to have come close to Sinwar, but that he managed to escape at the last minute. There was no single large network,

but a multiplicity of smaller separate tunnels strategically located. The tunnels were not a separate battlefield, but integrated with the terrain, allowing for continuous and fluid manoeuvres between surface and depth. The al-Qassam units may have attacked in a coordinated army-like fashion over the surface on 7 October, but in defending Gaza from the army's invasion, its organisational structures – regiments, battalions and platoons – morphed into a guerilla force of small independent units, each capable of operating semi-independently from areas they knew well, using local tunnel networks and excavating new underground links when they needed them. Tunnelling was undertaken throughout the war. Palestinian fighters created bypasses whenever a part of the tunnel collapsed due to aerial bombing. The tunnels were not static pieces of infrastructure, but dynamic systems that continuously evolved.

Videos posted by al-Qassam show their fighters climbing into buildings via tunnels, then moving between homes through party walls, climbing up to higher floors, using sniper guns or firing locally manufactured RPGs, named *Yassin*s after the group's founding leader, and then moving through buildings and rubble to another tunnel shaft. Other videos show Palestinian fighters exiting narrow tunnels right next to Israeli armour and attaching magnetic charges to them, or exiting the tunnels barefooted to raid military outposts.[189] Tunnel warfare short-circuited the notion of 'front lines' as they were able to reach the rear of military columns. In this way Palestinian guerillas were able to offset the size and technological superiority of the Israeli military on the ground and air. In the revolving door of military control, Palestinian fighters retreated when the army invaded (small units remained to fight guerilla wars) and returned after it withdrew.

In the summer of 2024, the army decided that as long as buildings and neighbourhoods were left standing it would not be able to defend its forces within the zone. It decided to continue 'draining the sea'. It stopped fighting urban warfare and simply ungrounded all areas it occupied so that no one could approach undetected. Traditional siege warfare is undertaken when the

invading army isolates cities by cutting supply lines. The Israeli army flipped the direction of siege warfare from the horizontal to the vertical, occupying and ungrounding the surface in an attempt to put the subsoil under siege from above.

Rafah

During the first eight months of the war, from October 2023 to May 2024, the main direction of displacement in Gaza was from the northern forbidden zone of Gaza City across the Netzarim Corridor and Wadi Gaza, to the southern concentration area. About 1.4 million Palestinians, the majority of whom were displaced repeatedly before arriving there, crowded the streets, open spaces, small gardens, fields, greenhouses and dunes in and around Rafah.[190] Israel did not invade the border strip – the Philadelphi Corridor – as long as it believed that it could push Palestinians across the border to Egypt, either with or without Egyptian consent.

Egypt did allow some individuals to leave but made exit the prerogative of the wealthy or well connected. In charge of border crossing, on behalf of the Egyptian government, was a private company called Hala, which was part of the Al Organi Group directed by Ibrahim al-Arjani, a member of a large local family affiliated to the al-Tarabin tribe, which had close ties to the Egyptian armed forces and to al-Sisi personally. Part of the al-Arjani family was displaced to Gaza in 1948. Some members were pushed further into the Egyptian Sinai during Sharon's counter-insurgency in the early 1970s. Ibrahim al-Arjani's mother was born in Khan Younis but he was born in Sheikh Zuweid just over the border in Egypt. With connections on both sides of the border the family was well positioned to be involved in the tunnelling operations that started in the early 1980s. The rise in the prominence of the Al Organi Group coincided however with the al-Sisi government crackdown on the tribes in Sinai in the later part of the 2010s. Ibrahim al-Arjani, who had built a sizable militia grounded in tribal networks, collaborated with the army

on establishing control over Northen Sinai in exchange for lucrative business opportunities. After the tunnels were destroyed as part of this campaign the al-Arjani family benefited from a monopoly control of formal crossing, and over the export of construction material into Gaza. For more than a decade, it controlled much of the overground trade coming into the Gaza Strip along the coastal route of northern Sinai.[191] Services included the warehousing, security, and the transport of goods including humanitarian aid. The group had a commercial interest in keeping trade overground and lobbied with the army to keep cross-border tunnels from re-emerging. The Egyptian army destroyed the Egyptian part of Rafah and rebuilt it a few kilometres away. Through the Hala company, the al-Arjani family controlled the exit of people from Gaza to Egypt. The high fees – $7,500 for a person exiting, charged by Hala to Palestinians seeking to escape the genocide – were Egypt's way of blocking a mass exodus and the Al Organi Group's way of augmenting its fortune. Even so, an estimated 100,000 Palestinians crossed the border, many remaining in Egypt without refugee status or the right to work.[192]

By spring 2024 the Israeli government realised that the mass exodus to Egypt would not occur by force and sought to concentrate all Palestinians in what they declared to be a humanitarian zone on southern dunes by the coast. The area was to function as a waiting room prior to expulsion. The army started making plans to drive a wedge between Gaza and Egypt by reoccupying the Philadelphi Corridor. Netanyahu began speaking about Rafah's smuggling tunnels, claiming that Israel would not be able to achieve 'total victory' – a phrase he began using around that time and which became synonymous with the genocide – without occupying the border strip and dismantling Hamas's presumed supply lines. It was through the Rafah tunnels, Netanyahu claimed, that Hamas was rearming during the war, and through those tunnels that Hamas's leadership could escape and Israeli captives potentially 'appear in Iran or Yemen'.[193] Without destroying the tunnels, Hamas would be able to

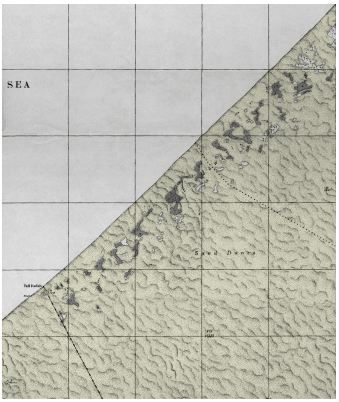
continuously resist the Israeli army, Netanyahu said (when they had finally gained control of the area, the Israeli army admitted there were no active tunnels leading into Egypt).[194]

The threat of Israel sending its tanks into the tent encampments of almost 1.5 million people along the border led to a renewed wave of global mass protests. Egypt threatened to suspend its peace agreement with Israel, which forbade the presence of large forces along the border. The US president Joe Biden, who supplied Israel with billions of dollars' worth of weapons and a total diplomatic umbrella, considered an attack on Rafah to be a 'red line', and warned of halting the supply of heavy bombs and bulldozers. It was then that he delayed the delivery of some bombs and D9 bulldozers, though this was a negligible action given that since October 2023 the US had supplied Israel with an estimated $18 billion in military aid. On 28 April 2024 more than a million Palestinians started to evacuate Rafah towards the so-called humanitarian zone on the coastal dunes. Israel expanded the borders of the humanitarian zone towards the north, but unknown to most Palestinians, it removed from these borders the southern part – the camp of Tel al-Sultan.[195] On 6 May 2024 the army invaded from east to west along the Philadelphi Corridor and seized the border terminal.[196] Unknowingly, many Palestinians kept moving into Tel al-Sultan.[197] As mentioned in Part II, Tel al-Sultan was built in the 1990s near the border, on the sand dunes between the city of Rafah and the coast, for Palestinian refugees from the Canada camp, and was often referred to as 'Canada Camp Palestine'.[198] Over the next two decades the camp grew into a dense urban area with roughly 40,000 inhabitants. On 24 May 2024, Tel al-Sultan was surrounded by Israeli armour.[199] On the same day the South Africa legal team submitted to the International Court of Justice an urgent request for provisionary measures to protect Palestinians in Rafah from genocide. The request relied on a report Nour and Omar at Forensic Architecture had urgently assembled. The court ruling was read out by the president of the court, Nawaf Salam (who would a few months later leave the

court to become Lebanon's prime minister): 'Israel must immediately halt its military offensive, and any other action in the Rafah Governorate, which may inflict on the Palestinian group in Gaza conditions of life that could bring about its physical destruction in whole or in part.'[200] Every reasonable reader understood this to be an order for an immediate halt to the offensive in Rafah.[201] A debate on grammar ensued. Israel pointed to the use of the two commas in the ruling, wilfully misinterpreting them and the meaning of the order to suggest that it was not to stop the invasion but to stop genocidal acts, which it anyway claimed it was not committing, and went on with the offensive. Two days after the order was given, on 26 May 2024, the Israeli army bombed a displacement encampment known as the 'Kuwaiti Peace tent camp' in Tel al-Sultan.[202] Forty-five displaced Palestinians were killed, many of whom were burned alive. Attacks didn't stop, and two days later, on 28 May, Israel attacked the 'humanitarian zone' of al-Mawasi, killing twenty-one Palestinians.[203]

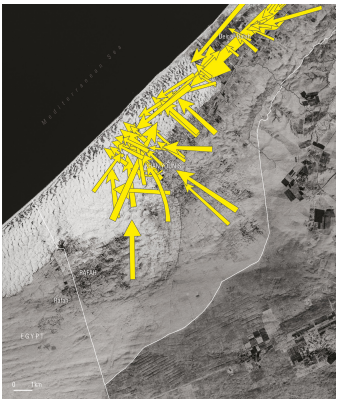
Al-Mawasi

Al-Mawasi is the name of the coastal dunes that begin south of the Wadi Gaza estuary and stretch southwards across the border to Egyptian Sinai.[204] Before 2023 it was the most sparsely inhabited part of the Strip, the most barren and the least developed. However some cultivation is always possible. In Arabic al-Mawasi means 'water siphoning'. The groundwater in this area is high and the inhabitants of the dunes, as discussed in Part I, needed to dig only shallow holes – known as al-Mawasi wells – to siphon it. These depressions were traditionally cultivated by the Palestinian Bedouin communities named after the place – as small but dense sustenance gardens. Maps drawn by British cartographers show little oases puncturing the sea of dunes.



The al-Mawasi dunes near the Gaza/Egypt border. Along the coast, the dunes are interspersed by pans, where orchards and vegetable gardens are irrigated through the syphoning of the high aquifer water level. Throughout the genocide, displaced Palestinians used the same traditional technique to obtain water. Survey of Palestine, 1942.

For years after 1967, one could still find the ruins of the holiday villas of Egyptian officers. A year after the war, in 1968, Israel established two Nahal outposts there to break off the continuity of Bedouin movement along the dunes between Sinai and Gaza. In the 1980s these outposts grew to become a block of seventeen settlements known as Gush Katif. Gush Katif was evacuated with the rest of Gaza's settlements in 2005 and Israel destroyed all the domestic buildings there. Palestinians turned the area into a largely agricultural zone using the settlements' greenhouses, but otherwise the area remained relatively empty.



Arrows derived from military evacuation orders delivered after the May 2024 invasion of Rafah. From that point on, civilians were forced from the agricultural area towards the coastal sand dunes. Forensic Architecture, 2025.

The dune area was first designated a ‘humanitarian zone’ on 13 October 2023. According to international law a humanitarian zone must cater for the basic needs of the displaced population, but Al-Mawasi dunes were unable to support the hundreds of thousands forcefully displaced into them. People were left scattered on the dunes without adequate housing, food or medical care. Some received tents delivered from humanitarian organisations. Family tents, designed to accommodate a dozen people, ended up housing many times this number. Those who couldn’t find tents constructed shelters using salvaged materials. Improvised homes occupied every available space. Some had to set their tents on the coast itself, others by the side of roads or amongst ruins. Those who could not find a place to pitch a tent slept outside.[205] The summer heat of over 40 degrees Celsius was fast approaching. Young children suffocated under the plastic sheets or improvised tin roofs. The sea was the only blessing, a means to cool down and wash (in July 2025 Israel announced that anyone entering the Mediterranean to swim, wash or fish would be shot). Displaced Palestinians would stay at the coast throughout the entire two years. The winter cold, as low as 5

degrees, led to death from hypothermia, particularly amongst infants. There was no electricity, save for the little that came from solar panels and diesel-powered generators, no running water, almost no sanitation and certainly no privacy.[206] Those who suffered most from overcrowding were the women and girls. The few toilets there were separated by a sheet of cloth that did not provide enough privacy. Women avoided going to the bathroom or showering for fear of being exposed. Some mothers stopped breastfeeding because of the lack of privacy. Accumulated puddles became breeding grounds for mosquitoes. Israel did not allow any chemicals to counter this. The wind filled blankets, clothes, mouths, ears, noses and the little available food with sand and rubble dust.[207]

At the same time, the humanitarian zone was being continuously targeted. As early as January 2024 Israeli tanks broke into the only functioning hospital in the zone and forced it out of service.[208] The humanitarian zone on the dunes is where conditions of life were calculated to keep people barely alive, to make conditions so unliveable that Palestinians would want to leave the moment the borders opened.

Acts of improvised resilience were important. Many relied on the traditional *mawasi* system for digging wells. Hadeel Assali, who with her family in Gaza promoted a project of mutual aid, described the way Palestinians there and elsewhere constructed traditional clay ovens to make bread.[209] The destruction of almost all school buildings in Gaza and the displacement of communities led local initiatives and organisations to operate makeshift schools, providing a sense of normality for displaced children.[210] Volunteer university lecturers established temporary learning spaces for all subjects and ages. Small, informal markets and makeshift medical centres also emerged.

Some were slightly more privileged. A family I know in Gaza lived before the war in a large private house near Khan Younis. When it was destroyed, they bought a large tent and took it to al-Mawasi. They removed the solar panels from the roof of the house and set them near their tent to power their electrical appliances.

The electricity brought some light, charged the phones, powered two electric ovens, and even a washing machine whose water feed was directly connected to a shallow underground well dug in the sand dune according to the traditional *mawasi* system. Regardless of the situation, the family's mother said, the children should wear clean shirts.

Tel al-Sultan

In the summer of 2024 the Israeli army believed that Yahya Sinwar and his close circle had made their way to Tel al-Sultan.[211] In September the army surrounded the camp, put the population that remained there under siege, and said it was starting to dismantle the 'maze of tunnels under Tel al-Sultan' – which meant that total ungrounding was imminent.[212] Destruction progressed from the periphery inwards, reducing the area within which al-Qassam units could move. The sand in this area is fine, like powder, and removing the paved surface made this powder overflow onto the surface. The powdered soil around the camp found its way into the mechanical systems that powered Israeli armour, slowing down its advance.[213] On 30 August, while demolishing a building in the camp, a bulldozer sagged into a hole. After it was extracted, soldiers discovered a tunnel shaft. When they sent in a drone they discovered the bodies of six Israeli hostages who had been executed, presumably when their captors heard the army approaching.

Around the same time, Israel escalated its attack on Lebanon. The low-level conflict had been unfolding for almost a year since 8 October 2023, when Hezbollah began firing artillery and rockets across the border in solidarity with Gaza. On 17 and 18 September 2024 Israel targeted communication devices of members of Hezbollah. The explosion of pagers and walkie-talkies killed 42 people, including twelve children, and wounded thousands. Israel also assassinated Hezbollah top commanders including, on 27 September, its leader Hassan Nasrallah in Beirut. At the beginning of October, the Israeli army began its invasion of

southern Lebanon, encountering fierce resistance on the ground.

On 16 October 2024 Sinwar and a small entourage moving with him fell upon a routine army patrol in Tel al-Sultan. For weeks the unit had been moving between tunnels and ruined homes on the surface. When they encountered the army the unit dispersed, and Sinwar, in full gear, combat fatigues and keffiyeh, escaped into a house at the intersection of Tel al-Sultan's main curved road – Ibn Sena Street – and the radial street. It was a dead end. A drone followed him into the house and recorded a video of Sinwar throwing a stick at the drone with his last strength – reports suggested he hadn't eaten in three days. The video became an emblem of defiance. The army fired shells at the house killing him. Only when soldiers entered the buildings did they realise that the dead fighter resembled Sinwar.[214] Mohammed Sinwar, Yahya's younger brother, was subsequently appointed head of Hamas in Gaza.

The West Bank

At the end of October 2024 Israeli attacks shifted back to the areas north of Gaza City. They cut the Mefalsim corridor that separated the refugee camp of Jabalia and the towns of Beit Hanoun and Beit Lahiya from Gaza City and ungrounded everything north of it. By January, there was hardly a building left standing north of Gaza City. In early November 2024 Donald Trump was re-elected president of the US. In early December, with Hezbollah and Iran weakened, President Bashar al-Assad of Syria fell to a rebel advance. Israeli troops moved into Syria and established a buffer zone between the Golan Heights it had occupied in 1967 and the rest of Syria. These events made Israel feel the Middle East was changing in its favour and gave it the confidence to attack Iran six months later, in June 2025. On 19 January 2025, shortly after Trump came to power, a ceasefire between Israel and Hamas came into effect. The agreement stipulated that the Israeli army withdraw to the buffer zone. Israel was also required to withdraw from the Netzarim Corridor and

allow the return of displaced Palestinians to the previously forbidden zone north of Wadi Gaza. In many of the areas from which the military retreated there was nothing left but a field of ruins.

Palestinians crossing Wadi Gaza northward toward Gaza City during the ceasefire of early 2025. It is a rare image of return, albeit within the Gaza Strip. Omar Al-Qattaa, 2025.

On 27 January 2025, the coastal al-Rashid Road was finally opened to Palestinian pedestrians. Images showed families walking across a bridge spanning the wadi towards a field of indistinct ruins that stretched as far as the eye could see. It was one of the first times since the Nakba in which Palestinians were returning en masse to areas from which they had been previously expelled by Israel. Salman Abu Sitta wrote about the scene as if it were an image of the future, an undoing of the Nakba. ‘They were walking, carrying their small things on their shoulders, on a bicycle or a cart, an old woman barely walking with a stick, a child carrying a child. A scene that will ever be remembered. This is their expression of RETURN, even symbolically to the same

refugee camp but still in homeland Palestine.'[215] The hundreds of thousands of displaced Palestinians returned in the hope that the war was over. Many documented themselves clearing rubble and arranging small living spaces among their ruined homes. In Rafah, at Eid al-Fitr, the holiday marking the end of Ramadan, Palestinians celebrated by placing long tables in paths cleared amongst the ruins.

Within the next month Hamas released thirty-three hostages, mostly women and men over the age of fifty. Israel released approximately 1,900 Palestinians, many of whom had been arrested after 7 October 2023 and held as hostages without charge as bargaining chips in prisoner-exchange deals. The prisoner exchange turned into a spectacle. Israeli captives were ceremonially put on stage behind large propaganda banners. Palestinian prisoners were forced to wear T-shirts with a Star of David and a statement 'we will not forget or forgive' in Arabic. Some Palestinian prisoners had the Star of David shaved into the backs of their heads.[216]

With the declaration of a ceasefire, the machine of annihilation slowed down but did not stop. Davide and Joshua at Forensic Architecture documented the first Israeli violation on the first morning of the ceasefire, when Israeli troops shot at a crowd of Palestinians returning to Rafah. A few days later they shot at Palestinians gathering south of Wadi Gaza waiting to cross north. We have thereafter recorded forty-one subsequent violations throughout the duration of the supposed ceasefire. Israel remained in the buffer zone and the buffer zone remained an annihilation zone. Over a hundred Palestinians were killed during the ceasefire, shot mainly because they crossed an unmarked threshold into the buffer zone.

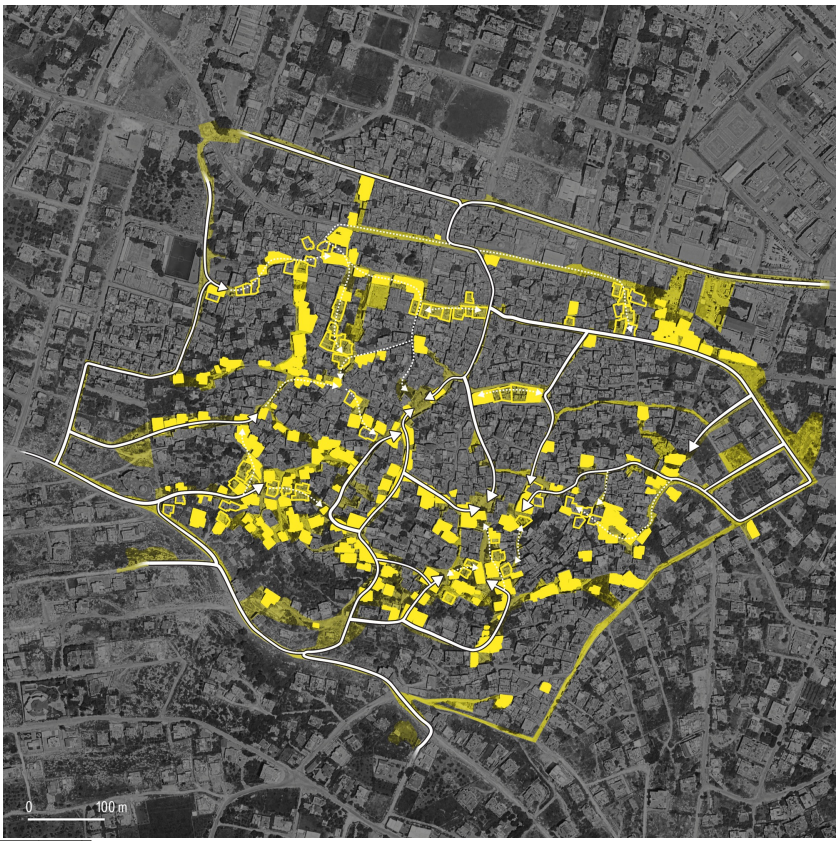
The widespread destruction in Gaza created a false impression of victory within the Israeli public, but Hamas's show of force in the prisoner-exchange ceremonies during the ceasefire demonstrated that the Israeli army had failed to defeat it. Experts explained that, as before, Hamas had managed to withstand the army through the use of tunnels. While by the fall of 2025 close

to 80 per cent of the structures above ground had been destroyed or damaged, only about 20 per cent of the tunnel system was demolished, according to the military's own estimates. Though they ran out of much of their ammunition, Palestinian guerillas were supplied by the Israeli air force. Unexploded bombs were attached with fuses and used to booby-trap buildings and roads.

The army was using the ceasefire as a 'technical break' to shift its forces elsewhere. Two days after a ceasefire came into effect, on 21 January 2025 the army began a long-planned military offensive in the northern part of the occupied West Bank. The operation targeted the large Palestinian refugee camps of Jenin and Tulkarm, and the small camps, of Nur Shams and al-Far'a. On 22 January 2025, a day after the assault began, the defence minister Israel Katz stated that Israeli forces were applying lessons learned from the Israeli military campaign in Gaza to the ongoing operation in Jenin. Finance minister Bezalel Smotrich boasted that 'Tulkarm and Jenin will look like Jabalia and Shuja'iyya. Nablus and Ramallah will resemble Rafah and Khan Younis. They will also be turned into uninhabitable ruins, and their residents will be forced to migrate and seek a new life in other countries.' Forensic Architecture researchers Jumanah Bawazir and Andra Pop-Jurj worked with Al-Haq to document this spillover of the genocide's techniques of destruction to the West Bank. Evacuation orders cleared the refugee camps of their inhabitants. Hospitals and clinics were attacked. The area of the camps was declared a 'forbidden zone'. Cleared of its inhabitants the army started to reshape the camps.[217] Routes wide enough for Israeli armoured vehicles were carved through the neighbourhoods, creating smaller blocks which could be easily isolated and controlled. The front blade of a Caterpillar D9 bulldozer is roughly four and a half metres wide. It can carve routes wide enough for an Israeli Merkava tank of 3.72 metres to pass through. After the first grid was carved through Jenin camp, a secondary grid was opened between the new routes, and slowly, there became more open space than built mass and the camps ceased to exist.

The army encouraged settler militias to roam freely, and often

participated in organised pogroms in Palestinian towns and villages hemmed in under siege, and, as Jumanah documented, murder Palestinian villagers with the aim of displacing entire communities.[218] The government was also approving plans for the construction of new routes and settlements in strategic places to carve apart the territory. ‘Every town, every neighborhood, every housing unit is another nail in the coffin of this dangerous idea,’ said Bezalel Smotrich, referring to the establishment of a Palestinian state.[219]



Design-destruction in the Jenin refugee camp in the northern part of the West Bank. The camp’s residents were expelled and the army carved a grid of roads wide enough for its armoured vehicles to pass through. When there remained more

void than solid the camp ceased to exist. Forensic Architecture, 2025.

The Medics

The ceasefire also allowed the army to undertake a smooth change of military command. On 5 March 2025, Eyal Zamir, the newly appointed chief of staff, assumed his role. In the previous three days no food, fuel, water or medical supplies were allowed into Gaza. Eager to please the extreme right government, on 18 March he ordered the army to break the ceasefire with a series of surprise night-time strikes on community and political leaders, killing more than 400. On 20 March, Israel dropped leaflets all over the Gaza Strip featuring crass genocidal messages with Quranic verses and drawings of biblical floods and destruction. 'The world map won't change if all the people of Gaza were to vanish…No one will notice you, no one will ask about you. You are left alone to face your inevitable fate.'[220] The army also vowed that plans for expelling all Palestinians from Gaza will 'proceed'. 'Neither the US nor Europe care about Gaza. Even your Arab states don't care, they are now our allies, they provide us with money, weapons and oil.' On the last statement, at least, they were right: 'The only thing they send you are shrouds.' The Israeli government approved the establishment of a Voluntary Departure Administration tasked with finding states that would accept expelled Palestinians. South Sudan, Ethiopia, Libya, Indonesia and Somaliland – a former British protectorate that unilaterally declared its independence from war-torn Somalia in 1991 – have been mentioned as potential destinations.

On 23 March 2025 Gaza's Ministry of Health announced its death count exceeded 50,000.[221] On the same day the Israeli army renewed its siege of Tel al-Sultan, ordering the Palestinians who had returned there during the ceasefire to evacuate immediately to the concentration area of al-Mawasi. There was intense bulldozer activity near Tel al-Sultan and the ground in the area began to rise into an artificial topography of powdery soil and rubble. On satellite images we couldn't yet make out what

this development was going to be.

Early that morning, a convoy of ambulances belonging to the Palestinian Red Crescent Society and other emergency vehicles, driving through this area, came under Israeli gunfire. A week later the bodies of eight Palestinian paramedics, six civil defence workers and an UNRWA employee were dug out from under a tall earth mound together with the crushed remains of their vehicles. [222] Though media groups widely reported the massacre, not all aspects of the event were clear. The Palestinian Red Crescent Society worked with Forensic Architecture and Earshot to produce a full spatial reconstruction and a forensic report. Our investigation had access to the entire duration of the media files captured by the Red Crescent medics and included 'situated testimonies' – interviews using immersive digital models with the incident's only two survivors, the medics Asaad al-Nasasra and Munther Abed. Asaad, who was the driver of one of two ambulances, was released by the Israeli army on 29 April after thirty-seven days during which he was interrogated and tortured in Israeli army facilities. He was back in Gaza and the meeting took place online, with Nour, Elliot and Samaneh sharing through a live link the detailed model they had produced. Accompanied by colleagues, Asaad and Munther retraced their steps through the digital environment at eye level and instructed our team in London on how to adjust the model when necessary. Nour was leading the conversations. Assad and Munther were visibly in shock, often breaking into tears, but were determined to go through the entire process, often rejecting our pleas to take a break or stop altogether. They wanted to reconstruct the scene in the fullest detail possible, aggravated by what some of the media that published on the issue got wrong. Everybody in the room in London was deeply affected and took time to recover; no one from our team will ever forget this process of reconstruction.

In the morning of 23 March 2025 the air force had bombed a residential building in Rafah. The Red Crescent was alerted. Two ambulances were sent to the scene. The first ambulance set off at 3.50 a.m. and approached Rafah from Khan Younis in the east.

Within two minutes, a second ambulance was sent from the direction of al-Mawasi in the north. A few minutes after the second ambulance was dispatched, the Red Crescent operators lost contact with it. Munther, who rode on the 'lost' ambulance, told us what happened: 'We were driving along and then the shooting started, I was in the back…The car was hit, the driver of the vehicle was shot and lost control of the vehicle which swerved to the left and stopped at the electricity pylon. The shooting stopped…I was hiding in the back seat…The soldiers arrived at the vehicle very quickly so they must have been nearby…They pulled me out, took me here, opposite the ambulance, and put me in this pit.' We tried to establish the location of the pit. 'I can show you exactly where the pit is, if you zoom out a little… exactly where the mouse is pointing…I was lying down flat, and they put an M16 rifle on my back.'

Once the first ambulance completed its duties in Rafah it joined a larger rescue mission which included two other ambulances – three altogether – in addition to a civil defence vehicle and a fire engine and set out to search for Munther's lost ambulance. Asaad al-Nasasra drove one of the ambulances on the rescue mission. Next to him was paramedic Refaat Radwan who recorded the drive on his camera phone. The video showed the dirt road lit only by the ambulance's headlights, while the audio recorded Asaad and Refaat praying for their colleagues' safety, their voices betraying dark premonitions. They passed by the missing ambulance, did not notice it and continued. They turned around, drove again along the same stretch of the road until they finally found the missing ambulance. The time was now close to 5 a.m. The video records first dawn and the sound of birds.

Munther was still in the pit with his head turned away from the road. 'The only thing I could make out were the lights of the ambulances.' Refaat exited his vehicle carrying his phone with him, filming, and began to walk with other medics towards the now found ambulance. A few seconds later the video started registering the sound of a hail of automatic fire: at least five shooters from roughly 50 metres, the audio analysis revealed.

From this moment Refaat no longer controlled the camera, the palm of his hand was pressed against the lens, but the camera was still on, recording the sound.

This still frame was recorded by medic Refaat Radwan just minutes before he was murdered. Through Refaat's fingers, which mostly covered his lens, we noticed Asaad al-Nasasra near an ambulance. The positioning of Refaat's camera allowed Earshot to calculate his distance from the sound of the gunshots that killed him. Earshot, Forensic Architecture and Palestine Red Crescent Society, 2025.

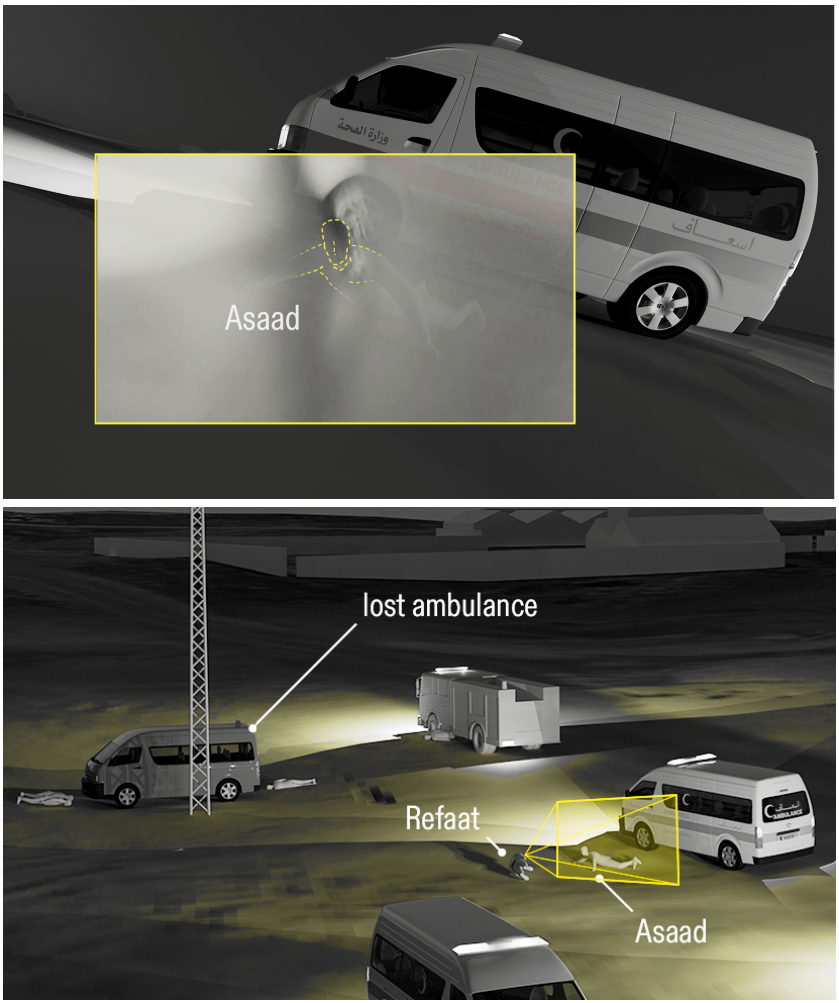
At one short moment his camera tilts and captures, between Refaat's fingers, someone crouching near him against the wheel of an ambulance. This single frame allowed Elliot to identify the location of Refaat and that of the ambulance. We showed the frame to Asaad who confirmed it was him. This was the spatial anchor for the audio reconstruction made by Earshot. Sitting with their headphones on for days, Lawrence's team identified the sound of at least 844 gunshots within six minutes. However, what made Earshot's analysis distinct was their focus on the echoes those gunshots produced. The time lag between the sound of the shots and their echoes helped them establish the location of the shooters in relation to the location of Refaat's phone. This was only possible because of the physical architecture of the scene. Often, Lawrence told me, in the audio recording of the shots they analyse in cases that take place in urban areas, echoes reflect

from many different directions. Here, the landscape was completely flattened but for three standing walls that somehow survived the total ungrounding of the surface. These were the source of the clear echoes. ‘We are hearing the result of the landscape flattened by bulldozers,’ Lawrence told me. ‘This is what ungrounding sounds like.’

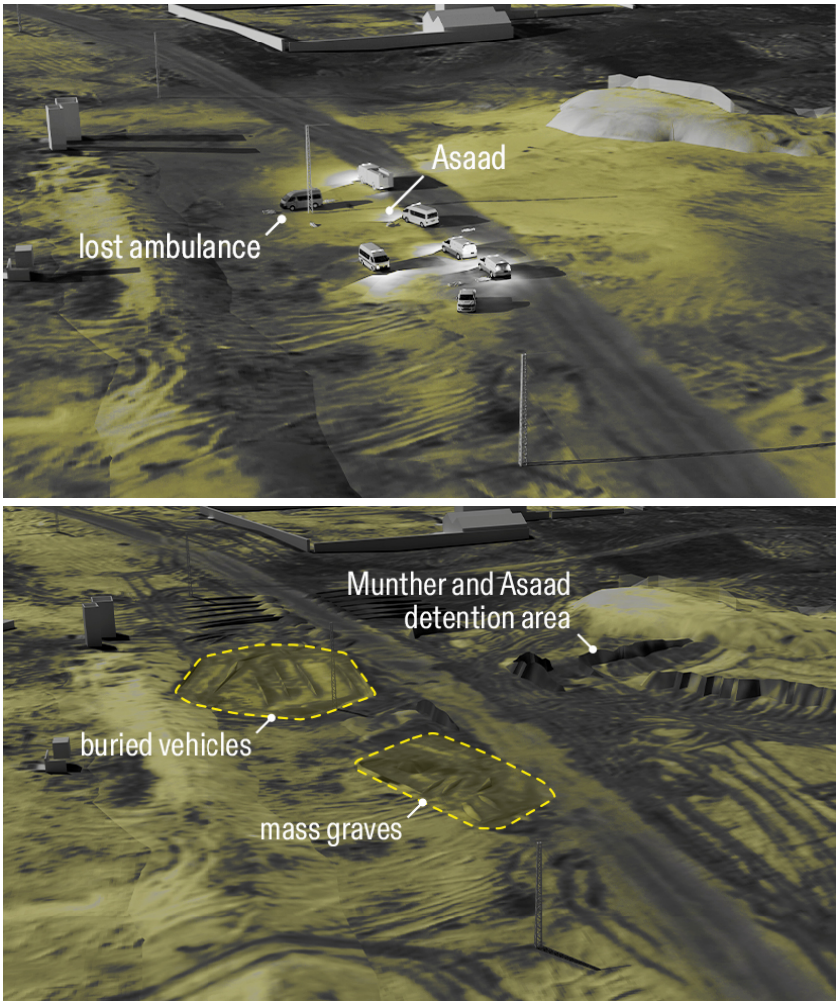
The audio analysis established that the location of the shooters was changing. The soldiers were charging towards the aid workers. In the virtual model Asaad showed us what he saw. He wanted to get things modelled as precisely as he could remember them. His memory was vivid, precise, every detail and every nuance of every movement counted, and he wouldn’t accept any inaccuracy. Pointing to the ambulance he asked, ‘Rotate just a few degrees clockwise…the whole body should be more to the north, just a little bit, forward a little bit, it looks correct, a tiny bit more. Exactly like that…yes.’

As the soldiers charged towards the medics the time gap between the shots and their echoes became longer, suggesting the shooters were moving away from the walls and closer to the ambulances. Refaat’s video was from this point pointed downwards towards the exposed ground, but the audio captured his own voice saying, ‘they are here’. Refaat started praying and recording a goodbye message to his mother. ‘Forgive me, Mom, forgive me. I swear I only chose this path to help others.’ The phone was found when his body was exhumed. A post mortem investigation confirmed Refaat was shot in his head. The audio analysis suggested that the soldiers were very close to the phone when it captured the sound of its owner being shot. The distance, Earshot estimated, was between one and four metres. Just before Refaat’s video ended a phone call between another medic, Ashraf Abu Libda and the Red Crescent headquarters began. The call was recorded by the Red Crescent. Synchronising its audio with that from Refaat’s video allowed our team to increase the precision of the spatial reconstruction. The final gunshots were captured on both soundtracks, allowing for triangulation. These shots were not automatic, or fired in fast succession, rather they were single and

deliberate. The echo of the sound of these single shots was reflected no longer from the walls but bounced between the surfaces of the ambulances themselves. The Israeli soldiers were walking between the scattered vehicles, amongst the medics, shooting anyone they found alive.



The matching of a single still frame captured by Refaat's camera phone allowed us to determine the location of Asaad and Refaat.



A before and after of the landscape transformation of the crime scene. Earshot, Forensic Architecture and Palestine Red Crescent Society, 2025–26.

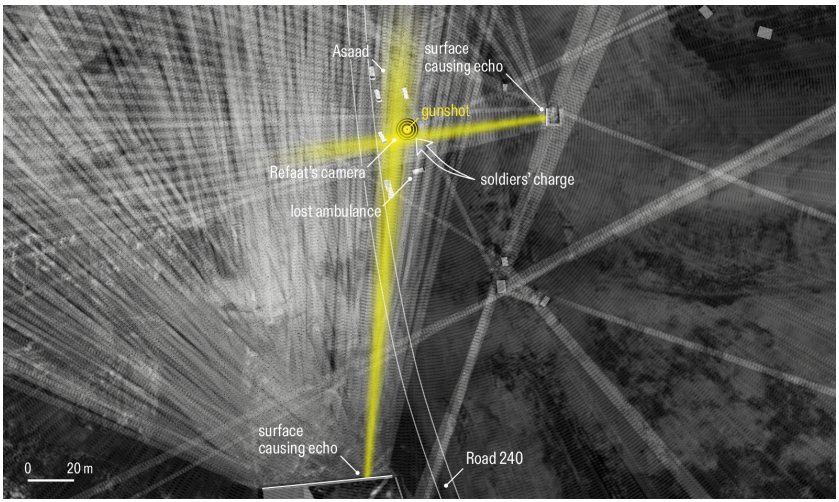
Once the Israeli soldiers were near, Asaad told us, he hid under the body of a dying friend. ‘I took Muhammad al-Hila…and I put him on top of me, so that we would die together.’ Pretending to be dead had saved his life. After some time, Asaad decided to take a risk and address the soldiers in Hebrew ‘*Ima sheli yisaelit*’ – ‘My mother is Israeli.’ Indeed the al-Nasasra is a large family of Palestinian-Bedouin origins that remained in the Negev. The soldiers, likely confused by the Hebrew, did not shoot. They

pulled Asaad up on his knees. They took his phone and buried it in the ground. He could now see the gruesome scene around him. The bodies of his colleagues were scattered between the ambulances. 'Why did you do this to us?' he asked the soldiers now in Arabic. 'One [of the soldiers] gestured to me to shut up.' Asaad was taken across the road as several tanks, bulldozers and drones arrived at the scene. The bulldozers started digging a pit. He pointed to the location of the same pit modelled by Munther. 'Here I saw Munther, his hands were tied.' The soldiers undressed Asaad and threw him in next to Munther. After a while 'The army came down with weapons into the pit. Munther, I think, was ready to die. In my head, I wasn't sure if they were going to bury us or not…I was beaten and interrogated. They told me no one knows if you're dead or alive…They said they would kill me, blow my brains out and bury me here…They swore at me…They called me Hamas. I just told them I am an ambulance worker. What else could I say?'[223]

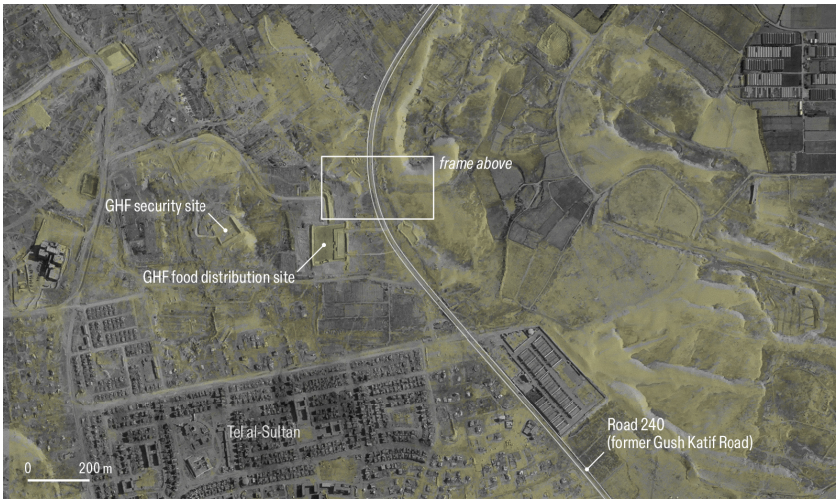
At Asaad's and Munther's instructions we corrected the modelled landscape that made the scene – the mounds of soil and rubble and the location and depth of the pit. Shortly after the massacre the soldiers called in a bulldozer which piled a huge earth mound over the bodies of the murdered medics and their ambulances. In the morning Asaad was able to see some of the scene from under the blindfold: 'I saw the place where everything had happened…they had changed the place completely. When I saw the place, it made me feel hysterical. I couldn't understand anything…' The topography created by the bulldozers while Munther and Asaad were in the pit made the location completely alien. Standing up Asaad noticed a bit of the fire engine poking through a high sand berm, crushed 'like a little cigarette packet.' Transforming the landscape was here used in an attempt to cover up the crime.

Later that morning, Munther told our team, the army asked him to put on his medic's uniform. 'We've got something we need you to do.' The army asked Munther to stand on the evacuation route out of Tel al-Sultan along which displaced Palestinians were

beginning to evacuate to al-Mawasi, and sort out the men from the women and children. Some of the women ‘were mothers carrying children who had been killed, one whose son had been shot in the chest. And another, who was also carrying her dead daughter, also shot in the chest. There was one young girl who had been shot in the right leg, and so many older people needing medical attention.’ Munther was not allowed to offer any medical help. ‘They were using me as a human shield.’ He was forced to bring the women, ten at a time, for inspection by the soldiers. After the women and children, Munther was ordered to line up the men. One by one he took off their glasses and hats and placed them in front of the army’s camera-operated facial recognition technology. ‘If there was anyone they wanted to arrest, they told me – bring him into the pit’ – a deep trench dug by a bulldozer. They beat him again before letting him go.



Earshot’s visualisation of the acoustic reflections of gunshots echoing off two of the remaining structures in an area otherwise ungrounded. The reflection of gunshot echoes allowed Earshot to establish the location of the shooters.



The area surrounding the site of the massacre was completely ungrounded (exposed surfaces in yellow) and piled into a compound to create the Gaza Humanitarian Foundation (GHF) food rations distribution centre. Earshot, Forensic Architecture and Palestine Red Crescent Society, 2025–26.

On 30 March, a week after the massacre the grave was opened by emergency workers using shovels, and the bodies of the fifteen murdered men were exhumed. After the exhumation the army continued transforming the landscape. Gradually a massive structure of soil piled into shapes was created right by the site of the killing. It included a large open yard enclosed by high piles of earth and rubble. It would later become clear that the site was to become a compound that the Israeli army and US private mercenaries erected to hand out food rations to Palestinians forced to south Gaza by hunger. The murder of the medics was not an isolated act, but directly related to other atrocities: the expulsion of the people of Tel al-Sultan, the ungrounding of the camp, and, finally, the weaponisation of aid.

Medics Asaad al-Nasasra (top) and Munther Abed (bottom) studying the shared screen while guiding the digital modelling process during a situated testimony interview with Forensic Architecture and Earshot in August 2025. Earshot, Forensic Architecture and Palestine Red Crescent Society, 2025–26.

The Tide

Shortly after Zamir took over the command of the army in early March 2025 he announced the expansion of the buffer zone from one to two kilometres wide, extending it over some 30 per cent of Gaza's territory. The army expelled all Palestinians from this area and began to systematically destroy every structure within it.[224] At the end of March, the army rolled the buffer zone further, from

two to three kilometres, extending over half of Gaza's territory. On 15 April Israeli bulldozers started to systematically destroy the entirety of Rafah and the camp of Tel al-Sultan, which lies in this extended zone.

Because the buffer zone now extended into such a large territory, snipers located along the perimeter found themselves out of range, and the killing had to be performed by small quadcopter drones equipped with grenade launchers which started to hunt for anyone present. During the day Palestinians were easily exposed against the monochrome backdrop. At night their body heat was picked up by the drones' thermal sensors. No one could collect the dead to bury. Stray dogs and abandoned house cats learnt to run towards the sound of gunfire like it was a Pavlovian bell.[225] Israeli politicians said the ungrounded zone will never be returned to Palestinians.

On 24 April 2025 Israel expanded the buffer zone further to include some 70 per cent of the Strip's territory.[226] It no longer made any sense to refer to it as a buffer zone. By 20 July the 'zone of military activity' included some 82 per cent of Gaza's territory. Palestinians were squeezed and crowded into a concentration area amounting to 18 per cent of the territory, divided into three territorial islands along the coast: al-Mawasi, Deir al-Balah and the coastal area of Gaza City.[227] These islands were where Israeli intelligence thought the remaining Israeli captives were held.

The expansion of the buffer zone was followed by a massive wave of demolition. The army said that levelling entire neighbourhoods prevented Hamas fighters from remaining in an area or returning to it when the army had to move away, but testimonies from politicians and bulldozer operators made clear that destruction had an ideological grounding. One of the bulldozer operators was a rabbinical court judge called Avraham Zarviv, a West Bank settler whose own home in the settlement of Beit El was put under a demolition order, since it was built outside the already permissive boundaries of the local settlement council. However, like almost all other demolition orders issued

against settlers, it has never been enforced. From 8 October 2023, Zarviv volunteered for reserve service, learnt how to operate a D9 bulldozer, and spent close to 500 days in Gaza. He described the logic behind the systematic destruction. ‘There are no flanks, there is nothing behind, we just move forward, and everything is destroyed,’ he said. ‘Bringing down a five- or seven-storey building is an acquired art,’ he added in a video that went viral; ‘I play the D9 like a musical instrument.’ His aim was to permanently expel Palestinians from the areas he levelled. ‘They will be returning to nowhere. Tens of thousands of families are left without papers, without childhood photos, without ID cards, they remain with nothing, if they return, they will not know where their home is. All they will find is sand.’ He described with satisfaction a new form of psychological torture in which blindfolded Palestinians were taken to an ungrounded area where their home once stood. ‘When we took the cloth off their eyes they were completely disoriented, they did not understand where they were.’ In the spring and summer of 2025 ungrounding became the army’s main mode of action. ‘That is the story here,’ Zarviv said. ‘They will not be able to return here for at least a hundred years.’[228]

With half its fleet of Caterpillar D9s destroyed by Palestinian fighters, and with the huge extent of the area to be ungrounded, the Israeli army was facing a shortage of bulldozers and operators and started to contract the work to private companies. Advertisements in Israeli newspapers offered 2,500 shekels (about £580) for the demolition of a building less than three storeys high, 5,000 shekels (about £1,160) for a larger building.[229] This lucrative pay was an incentive to destroy as many buildings as possible as fast as possible, despite the risks involved and the fact that some private bulldozer operator were killed by the Palestinian resistance.

Many of the contractors and operators came from the settler movement in the West Bank where for decades they were busy uprooting trees, destroying homes, flattening ground, and opening new routes. For them the bulldozer was not a tactical tool but a

sacred one employed in the holy war to cleanse Gaza of its inhabitants and prepare the ground for Jewish settlements. In a eulogy for a private-sector bulldozer operator, another West Bank settler killed by Palestinian fighters while destroying a home, a fellow settler said: 'Every time you returned from the rubble in Gaza you said, "Another 200 Arabs will not return to Gaza, another 500, another 1,000." You were proud of what you were doing.'[230]

In Gaza, like in other coastal areas, it is often the case that the nearer a neighbourhood is to the coastline the higher its buildings are. While in the rural fringes of Gaza, closer to the perimeter fence, single-family homes of a few storeys could be relatively easily brought down by bulldozers or trenchers, it was unsafe for a bulldozer – despite Zarviv's bravado – to destroy a building higher than five storeys. A new method of fast demolition referred to as 'floored-roof' was developed. First, a quadcopter drone drops a small explosive charge onto the roof of a building to create a hole. Then, a larger drone is sent in through the hole to place heavier explosive charges by the main columns. The explosives are then detonated by remote control.

Buildings over ten storeys high were left for the air force to bring down. Throughout the bombing rounds of the past two decades, the air force perfected its expertise in tower demolitions. Two jets simultaneously drop two bombs each near the foundations and the building collapses vertically.

The destruction of entire camps and cities creates enormous dust clouds containing particles of the different materials that formed the building and its environment – concrete, plaster, paint, glass, metal, sand, soil – some of which are synthetic and toxic. The cloud – geology and architecture in gaseous form – hovered over the Gaza Strip for the entirety of the summer of 2025. Palestinians were breathing the dust of what used to be their cities and homes. It covered everybody's skin, eyes, mouths, nostrils, it was present in food and water, and also covered the entire ground like a new layer of topsoil.[231] The dust cloud drifted with the wind further beyond Gaza to cover the coastal

plains, breathed in by all across Palestine's south and centre.

On Tuesday 13 May 2025, the areas around the European Hospital in Khan Younis, including several residential buildings, were subjected to heavy bombardment that the army said was aimed at a tunnel in which Hamas chief Mohammed Sinwar was located. The hospital was rendered non-operational. One of the homes bombed around the compound belonged to the al-Afghani family. The family's mother was Nour's aunt. At least fourteen members of her family – including nine women and children – were in the house when it was bombed. Immediately afterwards, relatives from nearby buildings rushed out to help, but they were shot at by an Israeli quadcopter. In a video of the civil defence team searching through the rubble, we could hear them shouting for survivors – and the faint voices of children calling out from beneath the rubble, and knocking on the broken concrete slabs. The quadcopter opened fire again. Hovering overhead, it prevented anyone from approaching those needing rescue. Desperate, and feeling the weight of every moment, we tried to alert everybody we could – physicians we knew in Gaza, politicians in Europe, and UN representatives – sharing the exact coordinates of the house in an effort to secure the army's permission for medics to offer help. The permission never came, and the voices under the rubble were slowly extinguished. Nour's cousins remain under the rubble to this day. We could do nothing more than hold on to her. We felt the pain of each breath we took as her relatives' lives withered away. There was no more desperate a week in Forensic Architecture during the entire genocide. It shattered what little remained of my hope that some compassion might still exist within the ranks of the Israeli army and made me question my conviction that there could be a common life possible in this place.[232]

The Architecture of Starvation

On 28 March 2024, in response to South Africa's petition, the International Court of Justice referred to the 'catastrophic

humanitarian situation' and instructed Israel to 'take all necessary and effective measures to ensure, without delay, in full co-operation with the United Nations, the unhindered provision at scale by all concerned of urgently needed basic services and humanitarian assistance, including food, water, electricity, fuel, shelter, clothing, hygiene and sanitation requirements, as well as medical supplies and medical care to Palestinians throughout Gaza'.[233] Flouting these rulings, Israel weaponised starvation and set out to systematically destroy the very UN mechanism built over decades to offer relief. A year later, in early April 2025 the United Nations announced that its food warehouses in Gaza were empty. Bakeries were shut. Starvation became widespread.[234] On 2 March 2025 Israel had decided to starve the people of Gaza, stopping all food.

The prohibition of the Genocide Convention on 'deliberately inflicting on the group conditions of life calculated to bring about its physical destruction' is the place where starvation and environmental destruction are closely interlinked. The engineering of starvation began with the ungrounding of the Strip's agricultural fields in the buffer zone along Gaza's entire eastern perimeter, where the fertile loess and clay soils are located. At the same time the army systematically destroyed Gaza's extensive fishing economy all along the coastline in the west. In previous times, Gaza relied on its fishing economy for food, and the area is famous for its fish dishes. Shourideh, Isabella Parlamis and Lucia Rebolino worked with Mahmoud al-Sarraj – Rushdi's younger brother, who continued working in Ain Media – to document the army's systematic sinking of most of Gaza's fishing boats, the bombing of its ports, piers, storage and processing facilities. Mahmoud sent us footage showing the murky water in Gaza port, choked with sewage, plastic and domestic refuse, a dead zone with parts of the fishing boats poking above the surface.[235] On 15 March 2025, the last days of the ceasefire, Mahmoud and four of his colleagues were assassinated after documenting the construction of a displaced person's camp in north Gaza. Only a few of the original crew –

now under the leadership of Rushdi's widow Shrouq Al-Aila – survived.

In April 2025 Israel struck one of the large water-desalination plants in Gaza City. Restrictions on fuel supplies meant the other desalination plants and water pumping from wells ground to a halt.[236] Israel was also weaponising thirst. The ungrounding of agriculture, of wells and the sinking of fishing boats destroyed Gaza's food sovereignty – the ability of Palestinians to feed themselves and mitigate the famine. Food and water could only come from outside through Israeli checkpoints, which were opened and closed at whim. Even when some food aid was let in, it was a fraction of what was necessary and was a means for Israel to relieve diplomatic pressures and buy the Israeli army more time to pursue its offensives.[237]

Alex de Waal – the veteran aid expert who became Forensic Architecture's close collaborator – wrote that the combined effect was a mass starvation that was 'minutely engineered, closely monitored, and precisely designed'. From the very beginning of the Israeli offensive, famine spread at an unprecedented speed. By December 2023 Palestinians in Gaza made up 80 per cent of the people in the world experiencing famine or catastrophic hunger. Never before in post-war history, de Waal wrote, had a population been made to go hungry so quickly and so completely as was the case for the 2.3 million Palestinians living in Gaza.[238] By April 2024, according to a report by Oxfam, people remaining in northern Gaza's forbidden zone had available a daily average of only 245 calories, slightly more than 10 per cent of the minimum daily calorific threshold the Israeli army had itself determined was the humanitarian minimum prior to October 2023. Rationed food meals, designed for one person, were divided into five and then ten to feed entire families. People scavenged for edible plants that miraculously continued to grow in small patches within the ungrounded fields.

Ibrahim al-Ghandur from Beit Lahiya in north Gaza described this experience to the Israeli human rights group B'Tselem in February 2024. 'Sometimes, we manage to find *khubeiza* [a leafy

plant known as Palestinian common mallow] growing by the roadside or in fields and we pick it. If we manage to find some cardboard or wood to make a fire, we cook it in water and then eat it for a day or two and at least manage to sleep better at night.' Barley, the crop so closely identified with the agricultural history of the Beersheba district, cultivated in recent decades mainly for animal feed, was particularly resilient to the ungrounding and degradation of soil brought about by the invasion. Some seeds must have remained in the upturned ground and small tufts of barley grew amongst the ruins after rain. For a while 'rewilded' barley became an important source of carbohydrates. 'We live off what we manage to get – a little rice, a little corn we ground, and also barley.' This was not nearly enough, 'People have started grinding bird and rabbit food. But there is not much of that either.'[239]

Food prices on the black market are an indication of the level of deprivation. In June 2025, in Gaza City, a twenty-five-kilogram sack of flour reportedly cost 1,800 shekels (about £420), a kilogram of sugar as much as 250 shekels (almost £60).[240] Famine most affected the poor and vulnerable, the elderly and the sick. Famished mothers could not breastfeed their babies. Malnourished toddlers lost their teeth, suffered liver and kidney failure and died in agony. The crime of starvation as a method of warfare – alongside the crimes against humanity of murder and persecution – were the reason for which the International Criminal Court issued a warrant for the arrest of Benjamin Netanyahu, and his then minister of defence Yoav Gallant in November 2024.[241]

Israel's perceived problem was that once it allowed food through the checkpoints and terminals, it lost control over distribution, and claimed, despite evidence to the contrary, that this food was systematically diverted by Hamas.[242] In reality most food aid was dispensed by experienced aid organisations, civil society, and private businesses which operated a network of hundreds of aid distribution centres and community kitchens. International aid agencies like the World Food Programme (WFP)

and UNRWA distributed aid through a UN-coordinated mechanism featuring around 400 locations near displaced-persons camps.[243] At Forensic Architecture we recorded hundreds of Israeli attacks on this aid infrastructure. We collected testimonies and videos showing Israeli tanks opening fire on people seeking aid, the Israeli air force striking food warehouses and bakeries at the moment when people gathered at them, the assassination of aid personnel and incidents when Israeli police looked away as Israeli civilians attacked convoys of trucks carrying aid before they entered Gaza, spilling food meant for starving Gazans, with onlookers cheering. We documented dozens of military attacks on aid convoys.[244]

The combined effect of the destruction of agriculture and attacks on aid was total chaos. Whatever little aid made it through was intercepted by starved civilians or looted by criminal gangs, which then sold the most valuable items – cheese, oil, sugar, flour, canned fish and meat – for extortionate prices.

In 2024 the Palestinian Civil Police formed a unit called Sahm – Arabic for ‘arrow’ – to protect aid from predator gangs and to keep public order along the bread lines, ATMs, and in markets. Whenever Sahm members were attacked while securing convoys, aid interception by gangs increased. Large families organised to secure and distribute aid, but the army had also interrupted their efforts. Unable to trust that the little available food would be equitably distributed, starved civilians were driven to storm aid trucks and warehouses when rumours spread that food had arrived.

Destroyed vegetation (yellow), destroyed greenhouses (black squares) and destroyed and damaged wells and other water facilities (black circles) between October 2023 and October 2025. The systematic destruction of agriculture across the Gaza Strip contributed to food scarcity, aggravated by Israeli military restrictions on aid delivery and the targeting of aid. Together, these compounding actions engineered widespread starvation. Forensic Architecture, 2025.

One of the most prominent gangs to take advantage of this engineered chaos was led by Yasser Abu Shabab, who in previous years had made a fortune out of using tunnels to traffic and trade in tramadol and other drugs.[245] He was detained by Hamas but escaped in October 2023 when Israel bombed the prison he was in. By May 2025 it became clear that the Abu Shabab gang – by then renamed al-Quwat al-Shaabiya (‘Popular Forces’) – was armed by the Israeli army and followed its orders, on occasions fighting Palestinian police and Hamas forces alongside Israeli forces. Trying to stoke more chaos, Israel tipped off the gang when food trucks were about to enter, encouraging it to fight the Sahm units for control over the aid.[246] On May 2025 the leaders of the al-Tarabin tribe, from which Abu Shabab hails, disowned him, proclaiming his ‘blood is forfeit’.[247]

Around that time, we noticed that the colour of the routes taken by the aid trucks was no longer the yellow-grey of Gaza’s ungrounded soil, but white. This was the result of many tons of precious flour spilling along the routes after aid trucks were

attacked by gangs or intercepted by desperate starved civilians. Israel used the aid distribution system to push Gaza's society towards a planned collapse.[248]

The weaponisation of famine is genocidal not only because starvation kills, but because it breaks the communal bonds that hold a people together – it seeks to reduce society into a collection of atomised individuals with only one aim: finding food.[249] Famine, de Waal wrote, is the sight of 'a woman cooking in secret, hiding food from her starving cousins. It's a family selling its grandmother's jewellery for a single meal, their faces blank and emotionless, their eyes glazed. This is the degradation, the humiliation, the shame – and, yes, the dehumanisation – that happens when human beings scrabble for food like animals.'[250] Alaa Alqaisi, a Palestinian poet and translator from Gaza, described the experience of hunger as a phenomenon consuming one's language. It 'seeps into the body and mind until both are softened, bent, worn…It clings to my ribs like a curse whispered too many times to be undone. No matter how I attempt to distract myself – by folding the same shirt again, by translating a familiar line, by stirring salt into boiling water as if that might change it – hunger resurfaces with quiet authority.'[251]

After destroying the existing mode of aid distribution grounded in Palestinian civil society and experienced aid organisations, Israel attempted to provide a militarised alternative. At the end of May 2025, after almost three months in which the army allowed no food into Gaza it began to provide some food rations – not enough by any standard – in fortified compounds near Gaza's border with Egypt, where it sought to concentrate the entire population.

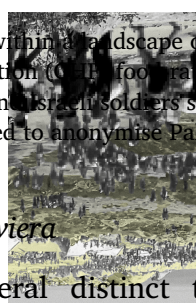
The militarised food distribution system began to be erected at the end of March 2025 on the ruins of Rafah and Tel al-Sultan by the border. The murder of the Red Crescent medics on 23 March 2025 had taken place within this same this construction site. The system comprised four compounds, one of which was built right by the place where the medics and their ambulances were buried.

Two more compounds were constructed nearby along the border. A fourth was built within the Netzarim Corridor on the banks of Wadi Gaza. None of the compounds was accessible from Gaza City and the rest of northern Gaza. To receive food Palestinians had to move south.[252] The system was designed and operated by a previously unknown organisation founded by a group of Israelis in the US, known as the Gaza Humanitarian Foundation or GHF. There was nothing humanitarian about the foundation. All four of the compounds had a similar layout, one of the most dehumanising and murderous of all spatial contraptions of Israel's architecture of genocide. Each station was arranged around a large enclosure – roughly 10,000 square metres – surrounded by high mounds of soil and rubble reshuffled from the ungrounded neighbourhoods and agricultural areas in which they stood. The back side of each compound was served by access roads for aid trucks. The front side was accessed by pedestrian routes for Palestinians seeking food. On both sides of these pedestrian routes, bulldozers shuffled rubble into a militarised topography of hills, some of which were crowned by tanks, others by sniper positions, or by remotely controlled guns aimed through cameras. Closer to the stations the pedestrian routes led into five parallel fenced corridors into which starved Palestinians were herded like cattle. At the end of each corridor was a remotely controlled gate. The design envisioned – though this technology was not yet in operation – that the gate would open after a biometric check as to the identity of the person seeking aid.[253] When opened, the gates led to the large compound where boxes containing dry rations were to be distributed.

At the end of May 2025 the system was ready for operation. The killings that began as soon as the stations were open were built into their architecture. Starved Palestinians were forced to walk dozens of kilometres within the artificial landscape. Because the stations were open at first light and for extremely short periods of time – the average we calculated was just twenty-three minutes – Palestinians were compelled to stay alert all night at the foot of the militarised landscape that surrounded the

compounds, ready for the signal that the stations were open. Competing for a limited amount of aid, they ran towards the compound from all directions. From their high positions, Israeli soldiers and US mercenaries shot at those that veered out of the designated routes. Those that managed to enter the compounds received from GHF contractors a cardboard box weighing twenty kilograms. The box included dry rations – pasta, flour, dried lentils or chickpeas, vegetable oil, salt and halva – but lacked clean water and essential food for anyone with special dietary needs: infants, the sick or people suffering from diabetes.[254] The closure of the stations was announced with live fire, sometimes shot right into the crowd of starved people that still attempted to approach.[255] One of the survivors of this carnage said that there are 'massacres happening every day. And still, we return – facing bullets and death just to bring home a bit of flour for our kids. It's not a trap; we call it the death arena.'[256]

In July 2025 Prime Minister Netanyahu ordered the army to design an entire 'humanitarian city' along the Egyptian border, with the GHF's stations as the only providers of food. From this concentration camp, he hoped, broken and starved Palestinians would be sent out of Palestine, requiring nothing but another little push, when the first opportunity arose.[257]



Palestinians walking within a landscape of earth and rubble piled up around a Gaza Humanitarian Foundation (GHF) food rationing station. From the crests of these hills, US contractors and Israeli soldiers shot at starved Palestinians. The image has been selectively blurred to anonymise Palestinians. @GazaNotice, 2025.

The Genocide's Riviera

There were several distinct types and waves of destruction imposed throughout Gaza since 2023 – each of which was also an act of design, aiming to shape the future of the Strip, the 'day after' the genocide. Destruction by air, artillery, tanks, bulldozers, and by sappers on the ground was not only the result of fighting but the essence of Israel's military objectives. It removed all

conditions that sustain political, cultural and biological life and created the *tabula rasa* on which different future developments could be imagined and imposed.

For the settler movement, inside and out of the government, ungrounding was the first stage in plans to recolonise Gaza. Whereas in the first attempt to settle the Strip, between 1967 and the disengagement of 2005, Jewish settlements were wedged between Palestinian camps and cities, in this new phase the settler movement sought a fresh start on a completely emptied and flattened ground.[258] In the summer of 2025 Bezalel Smotrich told a real-estate conference in Tel Aviv that the Gaza Strip is a potential 'real-estate bonanza' and promoted plans to annex the enclave. 'The demolition, the first stage in the city's renewal, we have already achieved. Now we need to build.'[259]

Like fresh blood, the flattened and ungrounded surface also attracted other real-estate sharks. On 4 February 2025, President Trump, with Netanyahu by his side, unexpectedly announced that the US would 'take ownership of the Gaza Strip'. Palestinians would be encouraged to displace to a 'nice place' elsewhere. Gaza, Trump said, had 'a phenomenal location…on the sea, the best weather' and would be developed as a 'Riviera of the Middle East'. While previously the US downplayed the destruction, the Trump administration now talked it up. Referring to the ungrounded surface, members of the administration said that Gaza was a 'demolition site' and that its development would require the complete evacuation of its people, as a technical necessity for the removal of tens of millions of tons of rubble and thousands of unexploded munitions. This was not born of a humanitarian concern for the well-being of Palestinians but confirmation that the reality produced by Israel's systematic destruction would require organised displacement.[260] Netanyahu, obviously pleased, said Trump was 'thinking outside the box'. Knesset Speaker Amir Ohana noted that it was 'the dawn of a new day'. A huge majority of the Israeli public was in support.[261] Trump was, however, thinking well within the box of Israeli strategic policy ever since 1948. Development was to

produce the displacement that could not have been achieved during the war.

In the summer of 2025, the same Israeli entrepreneurs that had established the GHF presented a new initiative titled the Gaza Reconstitution, Economic Acceleration and Transformation Trust, or GREAT, which sought to do to architecture what the GHF had done to humanitarianism. The plan proposed the development of the Strip under US trusteeship into a 'world-class' beachside resort, behind which a series of 'AI-powered cities' was to be located. The plan proposed Gaza's main artery, Salah al-Din Street, to be renamed 'MBZ Boulevard' after the United Arab Emirates president, Mohammed bin Zayed al-Nahyan, and a circular road named 'MBS Highway' after the Saudi crown prince Mohammed bin Salman, who'd be asked to foot the bill. Without any self-parody, the plan also envisaged an 'Elon Musk' manufacturing park. Palestinians would receive some meagre financial assistance toward moving elsewhere, anywhere.[262]

To pre-empt the settlers' and Trump's vision, on 4 March 2025, in the aftermath of Trump first floating his Riviera plan, and worried that it would end up with Palestinians expelled into their territories, Egypt, Saudi Arabia, Jordan and the UAE convened an emergency summit, where they proposed their own plans for the reconstruction of Gaza. The architectural master plan presented by Egypt during this summit had Gaza City as 'a green and smart city powered by renewable energy'. A few days after it was published the foreign ministers of France, Germany, Italy and the UK gave a joint statement welcoming this plan.[263] The fact that the same group of Arab states are those that, with Trump, brokered the ceasefire arrangement achieved in October 2025, just as this book was being prepared for print, turned the Egyptian master plan for Gaza into a point of reference again.

A study we have undertaken in Forensic Architecture of Gaza revealed that the Egyptian plan was drafted on the footprint of Israel's designed destruction and was shaped by it. The buffer zone in which Israel ungrounded entire villages, camps and towns, would remain as an 'open green area' where no structures

are rebuilt. The ‘security corridors’ that Israel carved through Gaza’s cities to slice the Strip into sections have also been incorporated into this master plan as traffic arteries. Such routes, if built, will facilitate repeated Israeli military raids.[264] The Egyptian plan is designed to allow Palestinians to remain in the Strip, but its urban shape will produce a submissive territory under permanent surveillance and military control.

This principle of destruction and reconstruction acting as tools of pacification follows a long-established colonial tradition.[265]Reconstruction plans imposed on Palestinians by planners working for, and following the interests of, others deny Palestinians the right to shape their own territory. They demonstrate the place Raphael Lemkin had for architecture in his conception of the crime of genocide, which involved, as mentioned above, the ‘destruction of the national pattern of the oppressed group’ and the imposition of a design by the oppressor. ‘This imposition, in turn,’ he wrote, ‘may be made upon the oppressed population which is allowed to remain, or upon the territory alone, after removal of the population and the colonisation of the area by the oppressor’s own nationals.’[266] The way peoples organised their space, Lemkin understood, is a manifestation of their history and social structure, while the imposed reorganisation of space destroys a society and group identity.[267] The destruction of Palestinian life in Gaza could thus, counter-intuitively, be completed by architectural means.

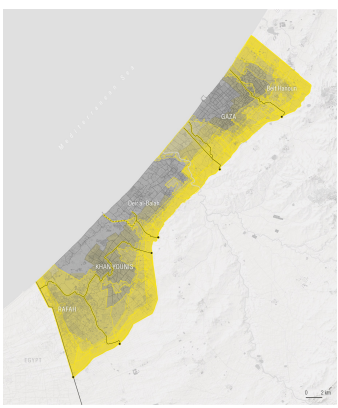
As I send this book to my publishers in October 2025 Forensic Architecture is gearing up to monitor the continuation of the erasure of Palestinian society in Gaza by forms of imposed developments. The near total destruction invites the same kind of large-scale development as in the Gulf region. Construction sites of this type are huge fenced-up areas that function as ‘extraterritorial zones’, governed by nothing but the logic of construction efficiency. The fenced building sites are cleared of all people, the surface levelled and compacted. Lines of infrastructure for water, gas and sewage are buried in trenches. Roads are laid out so that supply trucks can start delivering

material such as concrete, iron, steel and glass in bulk. When the buildings' skeletons are completed, modular elements such as for walls, windows, kitchens and bathrooms are brought in and assembled in a repetitive manner to reduce labour time and costs. Through the checkpoints and terminals, Israel will control every truck crossing into Gaza, giving it the ability to authorise or reject any construction project. Only construction workers can be within these fenced development sites during the long years of reconstruction. Some Palestinians will undoubtedly be offered jobs, but labour skilled in such industrialised type of production will no doubt have to be brought from abroad, as it has in the Gulf. Palestinians will be concentrated in camps at the margins of the huge fenced territories. Palestinians concentrated in these camps would be encouraged to leave and so, the humanitarian necessity to produce housing for hundreds of thousands of people could help produce the reality Israel tried to impose during war. Architectural reconstruction could thus function as the continuation of genocide by other means.

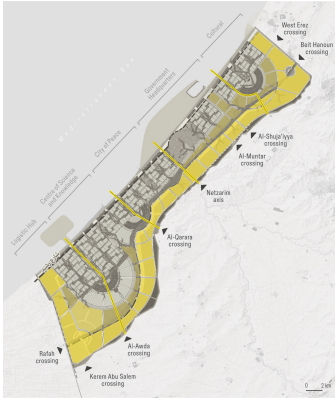
Ignored in all these initiatives are Palestinian planners and architects, as well as the wishes of the people in Gaza. In March 2025 a group made up of planners from Gaza's local authorities and Palestinians in the diaspora published their own reconstruction master plan named 'Gaza Phoenix' which is still in development. The plan, its authors write, evolved from 'the general philosophy adopted by municipalities, public bodies, experts, and Palestinian grass-roots communities both within and outside Gaza'.[268] The plan did not treat Gaza as a *tabula rasa*, as the Israeli army did, and the Egyptian plan and Trump's vision accepted, nor was it built on the contours of Israel's pattern of destruction, but was grounded in the 'social and spatial relationships that persist in Gaza'. Completely ungrounded neighbourhoods and camps – some of which, like the refugee camps of Jabalia, are historic centres of Palestinian national identity – are to be rebuilt, home by home, extruded out of their footprint. During the process of reconstruction, each Palestinian family would be housed near the sites of their demolished homes,

and communities would be reconnected and involved in reconstruction.[269] This type of development would reinscribe the surface thus negating the logic of ungrounding. In reference to the history of Palestinian resistance, the plan proposed a large tunnel connecting all Palestinian cities in the Strip – Rafah, Khan Younis, Deir al-Balah and Gaza, and from there continuing elsewhere in Palestine. This plan, like all plans to be made by Palestinians, will have to navigate the tension between the urgent needs for housing, education, hospitals and services and the maintenance of the refugees' political right to return to areas from where their families were expelled.

Indeed, any design confining Palestinian refugees to the borders carved into the ground by a plough blade in 1950 is bound to make permanent the form of spatial violence that the Gaza Strip is. Gaza should not remain a Strip, locked within the imposed borders of permanent siege, but returned to its larger region and the cities that composed its region – Beersheba, Hebron, Jerusalem and Jaffa.



Military corridors and the expanding 'buffer zone' along Gaza's perimeter, from October 2023 to October 2025. The underlying grid marks the army evacuation zones. Forensic Architecture, 2025.



The Gaza reconstruction plan proposed by Egypt in March 2025. The Egyptian five-year plan appears to have been shaped by Israel's pattern of destruction. It incorporates the buffer zone as well as several of the bisecting corridors. In yellow: open agricultural areas.

Coda

In the autumn of 2024, in preparation for the reconstruction of the village of al-Ma‘in with Salman Abu Sitta, Nour added the aerial images taken of the area by the RAF in January 1945 to a cartographic platform in which the team had already overlaid many satellite images of Gaza during the genocide. In early December 2024, a few days before Salman arrived at our offices, Samaneh called me over to her desk to show me ‘something very interesting’. When she flipped, by chance, between the 1945 British images and the most recent satellite image, she noticed that one of the paths along which Israeli armour broke into the Gaza Strip in early 2024 started from fields between the kibbutz settlements of Nirim and Nir Oz, where the centre of al-Ma‘in was in 1945. When armoured vehicles drive over fields their chains crush the vegetation, leaving behind them clear linear tracks. The satellite images showed a bundle of such pathways as the Israeli armour manoeuvred into formation outside Gaza. Tracing these pathways backwards led to a small ‘island’ within the fields. It was a military outpost – a fenced yard with a large antenna and one small building. Going back to the British aerial image from 1945 we realised that the building was already there. It was the home of Salman’s uncle, Mohamed Saqr or Abu Ibreisha. It was the building that the settlers called the White House, the only structure left standing of al-Ma‘in, likely because it was used for almost a year from April 1949 while the rest of the village was destroyed. The settlers drove their ploughs over all other remnants of al-Ma‘in – the blown-up stone houses, the abandoned cemeteries, the *karms* or fruit orchards, the school building, the agricultural storage facilities, the wells and the gardens – and

rubbed out even the small footpaths that connected them. The fields around the outpost grew over this ploughed surface. Throughout the past eight decades, the small military outpost has been used as a point of departure for army raids on the Khan Younis area in the south of the Gaza Strip. In 1999 artist and Nir Oz kibbutz member Chaim Peri turned the house into the 'White House Gallery'. In 2019 the gallery hosted a small exhibit on the history of Ma'in Abu Sitta.[1] Peri was seventy-nine when he was taken hostage on 7 October 2023 and killed in Gaza.

A composite of images divided along Gaza's perimeter fence (dotted white line). To the west (left) is a satellite image of Gaza from 2024; to the east (right) is RAF aerial imagery of al-Ma'in from 1945. In yellow are the traces of Israeli armoured movements and earthworks. The invasion into the Khan Younis area started from the small outpost near the 'White House' (Abu Ibreisha's house). The tanks' paths did not only traverse space but are also routes through time, forming a link between the Nakba and the Genocide. Forensic Architecture and Salman Abu Sitta, 2025.

In the contemporary image, we followed the tracks of Israeli armour that led out of Abu Ibreisha's house, across the fields

through the multilayered fencing system that surrounded the Strip. Across the fences the tracks opened like a fan. There must have been quite a few bulldozers travelling with the armour. We could see the clear marks of their blades scraping through the ground. They systematically fell on the citrus orchards, uprooted the vegetable gardens and flipped the fields that grew on the Gaza side of the fences and erased the agricultural roads as the tractors did in al-Ma‘in in 1949.

The route from al-Ma‘in to Khan Younis, along which the army raided, seems not only to traverse space, but also time. Acts of ungrounding connected the expulsions and destructions of 1948 with those of the present-day genocide. The scraping of the surface sought then and now to make impossible the return of Palestinians. However, for those willing and able to look closely, through the vale of the total devastation, faint traces always remain. A close and careful reading of the ground, through a combination of memory and photography, testimony and material traces, as this book has tried to demonstrate, can reveal not only what exists, but also the subtle traces of that which Israel has attempted to erase. These faint markers are anchors for return. When such return will take place, a process of re-grounding must slowly restore the life-giving quality of the damaged soil and its capacity to generate life.

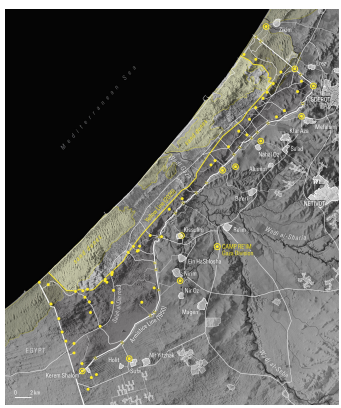
Update: The Yellow Line

The end of a book about a history presently unfolding is arbitrary. As I send this book to my publishers shortly after the genocide's second anniversary in late 2025, a new ceasefire between Israel and Hamas has begun to be implemented. The Israeli army withdrew behind a newly defined Yellow Line. The line runs roughly parallel to Gaza's perimeter, two to four kilometres within the territory of the Gaza Strip, leaving the Israeli army in direct occupation of over half of its territory. For most of its length, the line runs along the western slopes of the second sandstone ridge stretching parallel to the coastline. Atop the crest of this ridge, the army erected a series of military outposts out of piled earth and rubble. From these forts Israeli tanks and snipers command Gaza's remaining territory – an area of broken cities where the genocide's survivors are now crowded – and open fire on each Palestinian approaching or crossing the Yellow Line. The ceasefire did not bring an end to the killing. Only a few days into the ceasefire, the Israeli army has already killed dozens of people including entire families that inadvertently drifted into the kill zone whose borders were drafted on maps made in Egypt, Tel Aviv or Washington but only began to be demarcated on the ground.

East of the line, the area under Israeli military control, army bulldozers went on removing any trace of Palestinian habitation, and seemingly prepared the ground for a long occupation. The area where most of Gaza's agricultural lands existed is completely ungrounded, a desert from which the entirety of the population has been expelled. The US administration warns that if Hamas does not disarm reconstruction will only take place in this Israeli-controlled part of the Strip. It is hard to imagine that Israel will agree to build any Palestinian homes in areas under its control. The Israeli government hopes that what 'two years of war did not accomplish' – namely the destruction of Palestinian resistance and

the expulsion of Palestinians – ‘will be done by market forces’.[2] The extreme-right settler movement hopes to convert the front line of outposts into civilian settlements and cultivate the fertile lands behind them.

Over the past decades such ‘temporary’ ceasefire lines, presented as mere provisional arrangements, have solidified into the formidable borders of a lethal siege. If so, the Yellow Line will follow a similar process to that of the armistice line, the so-called Green Line, initially ploughed around Gaza. After 1948, Palestinians were kettled into the coastal enclave by a line of military-civilian outposts located on top of the third and highest of the sandstone ridges. The architecture of occupation may have advanced one ridge westwards, but no line ever remains unbreachable.


Mediterranean Sea
Ashkelon
Netivot
Ofakim
Ashdod
Ashqelon
Ashqelon
Ashqelon

this book on this page. Forensic Architecture, 2025.

Acknowledgements

Forensic Architecture is still working with the South Africa team in the case they brought against Israel at the ICJ in The Hague.

This book refers to this evidentiary work but should not be regarded as the actual evidence Forensic Architecture prepared and submitted in this and other cases. The latter can be found on FA's website. The choice to include relatively abstract images and maps in this book is intentional as I sought to avoid reproducing ground-level images of the kind that widely circulate online for reasons of privacy, safety and dignity. Nour still leads the work together with Jumana, Joshua, Omar and Davide, but she also started developing digital tools for the collaborative reconstruction of Gaza that centres Palestinian history and social structures, and is entangled with plans for return. My personal sense of total devastation is still present like a weight tied to my neck.

I am grateful for the trust of Palestinians in Gaza, in the rest of Palestine and the diaspora together with whom Forensic Architecture's work over the last two years has been produced. They include, amongst others, Ain Media, the Palestinian Red Crescent Society, Al Haq, the Hind Rajab Foundation, Al Mezan Center for Human Rights, Adalah, Fight for Falastin, Palestine Speaks Berlin, the Freedom Flotilla, Palestine Solidarity Campaign, and Palestine Action, amongst others. I would like to thank Shourideh Molavi, who as our dedicated Palestine researcher helped establish several of these connections.

We are still mourning the loss of several colleagues killed throughout the duration of this work. I'd like to honour the memory of Rushdi al-Sarraj, Mahmoud al-Sarraj and Ibrahim Mohammad Lafi. Nidal al-Wahidi and Haitham Abdel-Wahed are still missing. We learnt to know about life and death in Gaza through the lenses of Anas al-Sharif, Hassan Aslih and Ismail al-Ghoul. There are many family members of friends and colleagues who are dead or missing,

which we still need to come to terms with. Other friends and colleagues, like Al Haq and Francesca Albanese, are sanctioned by the US administration.

Salman Abu Sitta engaged me and the Forensic Architecture team in a deep and trusting collaboration – based not only on our shared belief in liberation and return but on our mutual fascination with history, space and its representations. I thank Salman for posing the questions that led to much of the research on the kibbutz settlements unpacked in Part I. I thank Ghassan Abu Sittah for his collaboration unpacked in Part III, as well as for feedback on this work. That the person who helped most with Arab-language sources could not reveal their name due to potential repercussions is a manifestation of the politics of suppression that many face worldwide.

The book greatly benefited from conversations with Mohammed Abujayyab centred mainly on the history of cultivation and of the cultivators in and around Gaza across the generations. I am also grateful for his careful reading of multiple drafts of this text. Francesa Albanese has been an ongoing interlocutor and a beacon of light in these dark times. Fernanda Eberstadt and Matt Fuller patiently read several rounds of drafts and proposed rewrites. Ines Weizman, Adrian Lahoud, Nour Abuzaid, Robert Trafford, David Wengrow, Adam Greenfield, George Prochnik, Elizabeth Breiner, Sharon Rotbard, Stefanos Levidis, and Dotan Halevi also generously read and offered important insights. Precious insights into the social and familial history of Gaza were gained from Basma al-Sharif. Illuminating conversations about this book were undertaken with Ahmad Amara, Mansour Nasasra, Matan Kaminer, Chris Wellbelove, Zvi Efrat, Ashraf Hamdan, Anselm Franke, Emily Jacir, Adila Hasim, Shawan Jabareen, Lawrence Abu Hamdan, Alex de Waal, Emilio Distretti, Elian Weizman, Einat Weizman and Eitan Diamond. I'd like to thank Adam Raz and Akevot for helping retrieve relevant historical documents.

Interviews about the book-in-the-making were carried out by Ashfaaq Carim for Middle East Eye, Fernanda Eberstadt for the *European Review of Books*, Ahmed Alnaouq on *Palestine Deep Dive*, and Michel Feher for *Diagrammes*. Parts of two earlier pieces written

for the *London Review of Books* found their way into the text thanks to Daniel Soar.

Lectures on this material were presented in, amongst other places, the David Graeber 2025 Memorial Lecture, in several lectures together with Francesca Albanese in Berlin, Rome and London, in the University of Illinois Chicago, in the Casa do Povo in São Paulo, Brazil, as a part of the Gaza Tribunal, at Mathaf: the Arab Museum of Modern Art in Doha, at Depo in Istanbul as part of the Gaza Biennale, and at my academic home – the Centre for Research Architecture (CRA) at Goldsmiths. At CRA Susan Schuppli, Stafford Scott, Christina Varvia, Kodwo Eshun, Ghalya Saadawi, Başak Ertür, Camp Studio and Lina Attalah (who in 2024 was Forensic Architecture guest professor) and the students engaged me in the lively discussion that makes the centre such a robust hotbed of ideas.

Work on soil has been going on at the CRA for decades, most notably by Paulo Tavares, whose illuminating writings included long reflection on the black soil of the Amazon. Tavares had also curated TERRA, the Brazilian Pavilion in the Venice Architectural Biennale for which he won the Golden Lion in 2023. Architect João Ruivo's thesis at CRA titled *Soil Politics* developed a critical theory of soil and mapped its place within Portuguese colonial projects in Angola, Mozambique and Guinea Bissau. Forensic Architecture and David Wengrow's collaborative work *The Nebelivka Hypothesis* looked at soil as an archaeological resource for understanding lost urban forms of non-hierarchal living. The Centre for Spatial Technologies, a Kyiv/Berlin-based architectural investigative and an affiliate of Forensic Architecture, mapped the cumulative damage brought by the Russian invasion on Ukraine's ecology by looking at and thinking about the country's damaged soil.

The book was assembled over the past two years alongside a fevered period of work undertaken with Forensic Architecture, but it benefited from an archive of maps, architectural plans, aerial images, and documents tracking the physical, architectural realities of the Israeli settler colonial project that I gathered over almost three decades.

I feel honoured to work alongside the many researchers of

Forensic Architecture in London and those of Forensis in Berlin who have given it all they had during months of genocide. I have attempted to integrate many of the team members by name into the flow of the narrative but beg for sympathy and forgiveness for any omissions made during a time of intense work. Over the course of the genocide, Forensic Architecture's extended team included: Angela Mehta, Amina Darwish, Sarah Nankivel, Samaneh Moafi, Robert Trafford, Nour Abuzaid, Omar Ferwati, Elizabeth Breiner, Davide Piscitelli, Shourideh C. Molavi, Joshua Richards, Jumanah Bawazir, Júlia Nueno Guitart, Lucia Rebolino, Andra Pop-Jurj, Nicholas Masterton, Kishan San, Peter Polack, Natalia Sliwinska, Elliot Bourne, Robert Mackey, Imani Jacqueline Brown, Dimitra Andritsou, Evi Chantzi, Isabella Parlamis, Madeleine Griffiths, Leela Jadhav, Agata Nguyen Chuong, Lola Conte, Tobechukwu Onwukeme, Mark Mushiva, Jasper Humpert, Phoebe Walton, Celina Abba, Emily Dische-Becker, Veronika Rau and Ebrahem Farooqui.

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I am grateful to Ines for being there for me, personally and intellectually, always and exactly when needed. Marco Ferrari was more than an image designer as credited but in assembling the maps and illustrations operated as a virtual investigator and creative partner. Thank you to Michal Shavit, David Milner, Kiara Barrow, Chris Wellbelove, Graeme Hall, Jamie Taylor, Seán Hayes, Peter Pawsey and Hazem Jamjoum for the careful edit. I am grateful to my friend Isabella Hammad for introducing me to my publisher Michal Shavit, and to Michal for approaching me to write this book, for the great faith in and support of the project, for persisting despite my hesitations and objections, and for her patience as deadlines flew by.

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2: Survey of Israel, likely 1950.
3: Ammar Awad/Reuters, 4 March 2024.
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25: Zoltan Kluger, Israel's National Photo Collection, 1946.

26: UN Photo/H., 1 June 1958. Original caption: 'Private Kahan Singh is an Indian soldier serving with UNEF in one of the three companies of the First Parachute Battalion (PUNJAB) which are stationed along the Demarcation Line. During his patrol duty on the Line, Kahan Singh occasionally has to warn civilians who come too close – such as the one in this photograph who wandered near the Line with his animals.'

27: Royal Air Force, Squadron 680, P.S.21, 28 January 1945, courtesy of Salman Abu Sitta/Palestine Land Society and Hebrew University of Jerusalem, Bloomfield Library for Humanities and Social Sciences, Aerial Photographs Collection.

28: Survey of Israel, 1956, courtesy of Hebrew University of Jerusalem, Bloomfield Library for Humanities and Social Sciences, Aerial Photographs Collection.

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41, 42: The Central Zionist Archives, S15M\1511 and S125M\1330\1.

43: Survey of Israel, Flight 073, 23 November 1952, Nimrod Leef Archive, Photogrammetric Institute Jerusalem, courtesy of Hebrew University of Jerusalem, Bloomfield Library for Humanities and Social Sciences, Aerial Photographs Collection.

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30. Al-Mubayyad, 'The Natural Factors Responsible for the Permanence of the City', in op. cit.; Khalid F. Ubeid and Alhasan S. Albatta, 'Sand Dunes of the Gaza Strip (Southwestern Palestine): Morphology, Textural Characteristics and Associated Environmental Impacts', *Earth Sciences Research Journal* 18, no. 2 (2014), pp. 131–42, doi.org/10.15446/esrj.v18n2.37238.

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31. The accumulation of sand, loess and clay between the sandstone ridges evolved into a brownish red soil created by the oxidising process of the iron in the clay which the local farmers called *hamra*, 'red' in Arabic. The villages of Beit Lahiya and Beit Hanoun to the north, and those of Khuza'a and Abbasan to the south, learnt how to cultivate this soil with citrus and other fruit orchards. *Hamra* contains a full spectrum of minerals and iron whose rust gives the soil its deep brownish-red hue. Ubeid and Albatta, op. cit., pp. 114–16; Roskin, op. cit., p. 380.

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32. J. P. Oleson (ed.), *Building for Eternity: The History and Technology of Roman Concrete Engineering in the Sea* (Oxbow Books, 2014), ancientportsantiques.com/wp-content/uploads/Documents/AUTHORS/Oleson2014-BuildingforEternity.

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33. Erin Cunningham, 'Ancient Gaza Roadway Still a Vital Resource', *The National*, 10 March 2010, thenationalnews.com/world/mena/ancient-gaza-roadway-still-a-vital-resource-1.502046.

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34. Edward Henry Palmer, *The Desert of the Exodus: Journeys on Foot in the Wilderness of the Forty Years' Wanderings*, 2 vols. (Deighton, Bell and Co, 1871), vol. 2, p. 297.

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35. Gideon Avni, 'Early Mosques in the Negev Highlands: New Archaeological Evidence on Islamic Penetration of Southern Palestine', *Bulletin of the American Society of Oriental Research* 294 (May 1994), pp. 83–100. For a more recent interdisciplinary approach, reading the military, agrarian, economic (human) and climate (desertification) histories against each other, see the Ancient Desert Agriculture Systems Revived (ADASR) project, mnemotrix.com/adasr/home.html.

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36. Leah Temper, 'Creating Facts on the Ground: Agriculture in Israel and Palestine (1882–2000)', *Historia Agraria* no. 48 (August 2009), pp. 75–110, historiaagraria.com/FILE/articulos/48leah.pdf; Nora Barrows-Friedman, host, 'Podcast Ep 60: The History of Wheat in Palestine', The Electronic Intifada, 24 June 2022, electronicintifada.net/blogs/nora-barrows-friedman/podcast-ep-60-history-wheat-palestine; Alessandro Petti, Sandi Hilal and Eyal Weizman, 'Decolonizing Architecture Art Residency', in *Architecture After Revolution* (Sternberg Press, 2013), pp. 178–87.

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37. Ayelett Shani, 'Why Israel Once Built Fine New Neighborhoods in

Gaza', *Haaretz*, 23 July 2022, haaretz.com/israel-news/2022-07-23/ty-article-magazine/.premium/gazans-laugh-at-israels-disengagement-israel-is-still-a-major-factor-in-their-lives/00000182-26fd-dfa9-a5c7-26fdfbdb0000; Dotan Halevy, 'Drinking Beer from the Sea of Gaza', in *Stripped: A Modern History of the Gaza Borderland* (Stanford University Press, forthcoming 2027).

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38. Ahmad Amara, 'The Negev Land Question: Between Denial and Recognition', *Journal of Palestine Studies* 42, no. 4 (Summer 2013), pp. 27–47, palestine-studies.org/en/node/162935. In the Naqab, land was bought mainly by Palestinian families from Gaza, Hebron and Jerusalem. Zionist organisations attempted to buy land from local farming communities but without much success. Zionists had more success buying land from land-owning families from Aleppo, Alexandria, Beirut, Cairo and Damascus, rather than from the farmers. These landowners, notable amongst them the Lebanese Greek Orthodox Sursock family, sold land to Zionist groups from 1901 to 1925, mainly in the north of Palestine.

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39. Abaher El-Sakka, *Gaza: A Social History under British Colonial Rule, 1917–1948* (Institute for Palestine Studies, 2018) , p. 132 (in Arabic); Abu Sitta, *Atlas of Palestine*, op. cit., pp. 6–8, 19, 256.

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40. Dotan Halevy, 'Sand and the City: On Colonial Development and Its Evasive Enemies in Twentieth-Century Palestine', *Environment and History* 29, no. 4 (November 2023), pp. 537–64.

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41. El-Sakka, op. cit., p. 140.

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42. Halevy, 'Sand and the City', op. cit.; El-Sakka, op. cit., p. 138; Gerald Butt, *Life at the Crossroads: A History of Gaza* (Rimal Publications, 1995), pp. 8–9.

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43. Nimrod Ben Zeev, 'Building to Survive: The Politics of Cement in

Mandate Palestine', *Jerusalem Quarterly* 79 (Autumn 2019), pp. 39–62; Fatina Abreek-Zubiedat, *A Territory in Conflict: Eras of Development and Urban Architecture in Gaza* (University of Pittsburgh Press, 2025).

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44. The PS series: named after Port Said, an airfield at the north end of the Suez Canal from which the aerial flights took off, PS was often mistakenly referred to as the Palestine Survey. Less than a year later, the Anglo-American Committee of Inquiry used these aerial images to calculate population numbers and levels of cultivation in order to draft the Partition Plan that was voted on in 1947. Weizman and Sheikh, op. cit.; Yiftachel, Kedar and Amara, op. cit., p. 100; a map, 'Distribution of the Nomad Population of the Beersheba Subdistrict', was compiled from information that included the aerial photographs of 1945. Background information on the compilation of this map can be found in Appendices 3 and 4 of United Nations, General Assembly, Ad Hoc Committee on the Palestinian Question, *Report of Sub-Committee 2 (1947)*, A/AC.14/32, unispal.un.org/pdfs/AAC1432.pdf; Ian Black and Benny Morris, *Israel's Secret Wars: A History of Israel's Intelligence Services* (Hamish Hamilton, 1991), p. 129; Gil Eyal, *The Disenchantment of the Orient: Expertise in Arab Affairs and the Israeli State* (Stanford University Press, 2006), p. 85.

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45. Havatzelet Yahel and Ruth Kark, 'Israel Negev Bedouin during the 1948 War: Departure and Return', *Israel Affairs* 21, no. 1 (2015), pp. 48–97. The total number of the Jewish rural population in the Negev on the eve of the November 1947 partition resolution was estimated at about 3,000.

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46. In Walid Khalidi, *All That Remains: The Palestinian Villages Occupied and Depopulated by Israel in 1948* (Institute for Palestine Studies, 1992), pp. xvii–xx, relying on the *Palestine Index Gazetteer* (1945) and the *Village Statistics* (1945), both compiled by the British Mandatory authorities, which listed 418 depopulated and destroyed villages. However, Salman Abu Sitta's figure of 531 includes seventy-seven destroyed Bedouin villages in the Naqab (2004: 71); his estimate is that 805,000 Palestinians lost their homes.

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47. Zochrot, ‘Testimony of Amnon Neumann’, YouTube video, published 28 December 2011, youtu.be/KS4OXOom_vk (in Hebrew).

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48. Sheren Falah Saab, ‘ “Depopulation,” “Kill Zone,” and “Second Nakba”: The Lexicon of Brutality Exposes How Israelis Talk About the War’, *Haaretz*, 4 May 2025, haaretz.com/israel-news/2025-05-04/ty-article-magazine/.premium/depopulation-kill-zone-and-second-nakba-the-new-hebrew-war-dictionary-is-out/00000196-871b-d22a-a3de-b73f3dfd0000; a similar experience is recorded by a Palestinian woman named Ablah Awad. ‘They attacked us in our homeland and drove us to Gaza…and now the Nakba has come again’, Reuters, 15 November 2023. A Palestinian woman lives the Nakba twice: ‘We die of hunger and thirst…have mercy on us’ [Arabic original]. 24ae. https://24.ae/article/790527/%D9%81%D9%84%D8%B3%D8%B7%D9%8A%D9%86%D9%8A%D8%A9-%D8%AA%D8%B9%D9%8A%D8%B4-%D8%A7%D9%84%D9%86%D9%83%D8%A8%D8%A9-%D9%85%D8%B1%D8%AA%D9%8A%D9%86%E2%80%93%D9%86%D9%85%D9%88%D8%AA-%D9%85%D9%86-%D8%A7%D9%84%D8%AC%D9%88%D8%B9-%D9%88%D8%A7%D9%84%D8%B9%D8%B7%D8%B4-%D8%A7%D8%B1%D8%AD%D9%85%D9%88%D9%86%D8%A7.

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49. Salman Abu Sitta, *Mapping My Return: A Palestinian Memoir* (The American University in Cairo Press, 2016).

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50. FA, ‘The Massacre at Tur al-Zagh: Al-Dawayima, 29 October 1948’, last modified 2025, forensic-architecture.org/investigation/the-massacre-at-tur-al-zagh; FA, ‘Executions and Mass Graves in Tantura, 23 May 1948’, last modified 2023, forensic-architecture.org/investigation/executions-and-mass-graves-in-tantura-23-may-1948.

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51. Months later Salman presented the reconstruction we have together produced to a group of family members in Amman. Hassan Nassar

Abu Sitta, who was likewise born in al-Ma'in, said the reconstruction 'took us on a journey through time and space to see our beloved town'. PalestineLandSociety, 'A meeting of the Abu Sitta family about Ma'in Abu Sitta in two hundred years', 8 August 2025, youtube.com/watch?v=GSwfXxIqaFM (in Arabic).

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52. This remainder is reminiscent of the city of Ersilia in Italo Calvino's *Invisible Cities*. 'The inhabitants stretch strings from the corners of the houses, white or black or gray or black-and-white according to whether they mark a relationship of blood, of trade, authority, agency. When the strings become so numerous that you can no longer pass among them, the inhabitants leave: the houses are dismantled; only the strings and their supports remain. From a mountainside, camping with their household goods, Ersilia's refugees look at the labyrinth of taut strings and poles that rise in the plain.' Italo Calvino, *Invisible Cities* (Harcourt Brace Jovanovich, 1985), p.76, William Weaver trans.

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53. Susan Beckerleg, 'African Bedouin in Palestine', *African and Asian Studies* 6, no. 3 (2007), pp. 289–303, doi.org/10.1163/156920907X212240.

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54. Sherene Seikaly, 'How I Met My Great-Grandfather: Archives and the Writing of History', *Comparative Studies of South Asia, Africa and the Middle East* 38, no. 1 (2018), pp. 6–20; Abu Sitta, *Mapping My Return*, op. cit., pp. 6–7.

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55. Abu Sitta, *Mapping My Return*, op. cit., pp. 5–6.

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56. Survey of Palestine 1947, supra note 3, vol. 1, p. 370, cited in Abu Sitta, *Atlas of Palestine*, op. cit., p. 24.

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57. FA, 'Torture in Saydnaya Prison', forensic-architecture.org/investigation/saydnaya; Lawrence Abu Hamdan, *Saydnaya (the*

Missing 19dB), audio-visual installation, 2017, collaboration with Amnesty International and Forensic Architecture, lawrenceabuhamdan.com/saydnaya. In 2016 survivors of the Assad regime worked with us to reconstruct the torture prison of Saydnaya in Syria, previously a 'black hole' of which little visual representation let alone photographs existed. Survivors created the architecture of the prison from recollection of what they saw but primarily of what they heard, as they were led blindfolded. The number of tiles gave us the size of the rooms. The quality of the sound allowed our long-term partner the acoustic expert Lawrence Abu Hamdan to reconstruct the size of places. When the Saydnaya prison was liberated with the fall of the regime at the end of 2024, the model, which we put as an open-source resource online, proved to be extremely precise; FA, 'A City Within a Building: The Mariupol Drama Theatre', forensic-architecture.org/investigation/a-city-within-a-building-the-mariupol-drama-theatre; FA, 'The Grenfell Tower Fire: Situated Testimonies', forensic-architecture.org/investigation/the-grenfell-tower-fire-situated-testimonies; FA, 'Drone Strike in Mir Ali', forensic-architecture.org/investigation/drone-strike-in-mir-ali. In one of our first uses of this technique in 2013, we built with a survivor of a drone strike a model of her home in the town of Mir Ali in Pakistan, near the Afghani frontier. The witnesses could not recall what had happened after the blast. By modelling the building together room by room, placing one piece of furnishing after another according to her description, recollection slowly grew.

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58. Abu Sitta, *Mapping My Return*, op. cit., p. 68.

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59. Ibid., p. 69.

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60. Beni Meitiv (Motilov), *The Sowers in the Desert* (Sifriyat Hapoalim, 1963), pp. 58–9.

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61. Aharoni quoted in Uri Davis, 'In Search of the Abu Sitta Sword', *Left Curve* no. 32, 2008, pp. 36–49.

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62. Abu Sitta, *Mapping My Return*, op. cit., pp. 69–72.

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63. Benny Morris and Benjamin Z. Kedar, ‘ “Cast Thy Bread”: Israeli Biological Warfare during the 1948 War’, *Middle Eastern Studies* 59, no. 5 (2023), pp. 752–76, tandfonline.com/doi/abs/10.1080/00263206.2022.2122448; Sarah Leibowitz-Dar, ‘Germs in the Service of the State’, *Hadashot*, 13 August 1993.

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64. Zochrot, ‘Leaflets Dropped by Israeli Aircraft on the Residents of al-Lyd and Ramle on July 11, 1948’, 11 July 1948, zochrot.org/index.php?/publication_articles/view/56439/en.

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65. Morris and Kedar, op. cit.

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66. Carmit Gai, *Bar Lev: A Biography* (Am Oved, 1998), p. 64, in Adam Raz, *Loot: How Israel Stole Palestinian Property* (Verso, 2024), p. 152.

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67. Yahel and Kark, op. cit.

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68. Michael (Mickey) Cohen, transcription of interview, recorded 26 July 2012, Tel Aviv, YouTube video, 8:24, youtu.be/KLVpEp_dHm0.

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69. Yahel and Kark, op. cit.

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70. These villages are al-Khisas, Jira, Khirbat Khuza’a, Bi’lin, al-Jiyya, Barbara, Bayt Jirja, Hiribya and Dayr Sunayd. See Ilan Pappé, ‘An Indicative Archive: Salvaging Nakba Documents’, *Journal of Palestine Studies* 49, no. 3 (Spring 2020), pp. 22–40.

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71. Abu Sitta, *Mapping My Return*, op. cit., p. 110.

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72. Cohen, op. cit.

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73. Cohen, op. cit. See also Zochrot, 'Testimony of Amnon Neumann', YouTube video, 1:03, published 27 December 2011, youtube.com/watch?v=KS4OXOom_vk, in Hebrew. In his testimony, Neumann says, 'We burnt their houses with the hay roofs…We came to inherit their land.'

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74. Aref al-Aref, *Ghazza 'Abr al-Tarikh* (*Gaza Through History*) (Maktabat al-Muthanna, 1943), p. 250.

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75. Ibid., pp. 278–8.

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76. al-Mubayyad, op. cit.; Nu'man al-Qasatli (eds Shawkat Ramadan Hujjah, 'Imad Rif'at Bishtawi and Muhammad 'Alami), *Al-Rawdah al-Nu'maniyya on Traveling through Palestine and Other Levantine Lands* (Mu'assasat Hamada li'l-Dirasat al-Jami'iyya wa'l-Nashr wa'l-Tawzi', 2011), p. 200; Gideon M. Kressel, Joseph Ben-David and Khalil Abu Rabi'a, 'Changes in the Land Usage by the Negev Bedouin since the Mid-19th Century: The Intra-Tribal Perspective', *Nomadic Peoples* 28 (1991), pp. 28–9; Emanuel Marx, 'The Political Economy of Middle Eastern and North African Pastoral Nomads', in Dawn Chatty (ed.), *Nomadic Societies in the Middle East and North Africa: Entering the 21st Century* (Brill, 2006), p. 90.

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77. Jochen Lingelbach, 'Swimming to Safety', Refugee History (blog), 24 September 2020, refugeehistory.org/blog/2020/9/24/swimming-to-safety; Ishaan Tharoor, 'The Forgotten Story of European Refugee Camps in the Middle East', *Washington Post*, 2 June 2016, washingtonpost.com/news/worldviews/wp/2016/06/02/the-forgotten-story-of-european-refugee-camps-in-the-middle-east/.

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78. Ilana Feldman, *Governing Gaza: Bureaucracy, Authority, and the Work of Rule, 1917–1967* (Duke University Press, 2008), pp. 150–51.

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79. The State of Israel, Ministry of Defense, IDF Archive, file 1046, 70/434, 6 April 1949, p. 8.

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80. Ruth Kark, *The First Observation Posts in the Negev, the Sixtieth Anniversary: 1943–2003* (in Hebrew) (Ariel Publishing House, 2003).

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81. Ibid.

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82. The State of Israel, Ministry of Defense, IDF Archive, file 1046, 70/434, 6 April 1949. See also Yosef Weitz, as quoted in Alon Tal, *Pollution in a Promised Land: An Environmental History of Israel* (University of California Press, 2002), pp. 8, 69–92.

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83. Ibid.

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84. Ibid.

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85. Yosef Weitz, *Diaries*, vol. 3 (1965), p. 288, (in Hebrew) entry for 20 May 1948, as cited in Benny Morris, 'Yosef Weitz and the Transfer Committees, 1948–49', *Middle Eastern Studies* 22, no. 4 (Masada Books, October 1986), p. 542 (in Hebrew).

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86. Hanna Hamdan, 'The Settlement Policy and the "Judiazation" of Space in the Negev', *Adalah Electronic Sheet*, 11 March 2005 (in Hebrew); Gadi Algazi, 'The State of Israel vs. Citizens of Israel', *Tarabut*, 28 July 2010, tarabut.info/en/articles/article/al-arakib-demolished.

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87. The State of Israel, Ministry of Defense, IDF Archive, file 1046, 70/434, 6 April 1949; Weitz lecture, op. cit. (my translation from Hebrew).

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88. The demarcation runs according to the agreement: '3 kilometres east of the Highway, then in a southerly direction parallel to the Gaza–al-Majdal Highway, and continuing thus to the Egyptian frontier'. 'Egyptian-Israeli General Armistice Agreement, February 24, 1949', The Avalon Project, Yale Law School, 2008, avalon.law.yale.edu/20th_century/arm01.asp.

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89. Ibid.

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90. Mordechai Bar-On, 'The Struggle over the Achievements of 1948: Israel's Defense Policy', in Zvi Zameret and Hanna Yablonka (eds), *The First Decade, 1948–1958* (Ben-Zvi, 1997), p. 99 (in Hebrew).

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91. Nir Meir, secretary general of the kibbutz movement, said: 'From the first moment that the Zionist idea came to fruition, everyone understood that without sovereignty over the land, there is no sovereignty over the country. Trumpeldor said that where the plow goes, that is where the border will be determined.' My translation from Hebrew.

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92. Meron Benvenisti, *Sacred Landscape: The Buried History of the Holy Land since 1948,* trans. Maxine Kaufman-Lacusta (University of California Press, 2002), p. 19; 'Governmental Names Committee' (Va'adat ha-Shemot); Nadia Abu El-Haj, *Facts on the Ground: Archaeological Practice and Territorial Self-Fashioning in Israeli Society* (University of Chicago Press, 2002), Chapter 4, 'Terrains of Settler Nationhood' and Chapter 5, 'Positive Facts of Nationhood'.

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93. This continues today, as publishers of satellite imagery, including Google, continue to erode the presence of Palestine either by

publishing low-resolution imagery, suggesting incorrect route options for Palestinians, labelling inaccurate and/or Hebraicised place names, or simply leaving territories inhabited by Palestinians blank – a pixelated *terra nullius*. Mapping software, in line with Israeli state policy since 1948, do not name or otherwise mark the Palestinian Bedouin villages that remained or returned to their lands. These communities have also been written off all travel maps, to the extent that travellers, guided by GPS navigators, often drive into these communities unprepared.

BACK TO NOTE REFERENCE 93

94. What Oren Yiftachel has called the 'dead Negev doctrine' is an Israeli version of the colonial principle of *terra nullius* ('empty land', void of sovereignty or ownership) – a legal principle originating at the 1884–5 Berlin Conference that disregarded native forms of government cultivation and settlement and dispossessed Indigenous people in Africa, Australia and other places throughout the colonial world, based on the argument that they were 'part of the natural environment'. Yiftachel, Kedar and Amara, op. cit., (in Hebrew). On *terra nullius*, see Sven Lindqvist, *Terra Nullius: A Journey Through No One's Land*, trans. Sarah Death (New Press, 2007). The legal battles of the Bedouins are thus related, Yiftachel explains, to those of Indigenous peoples in countries such as Australia, Canada, South Africa, India and Brazil. For comparison, see also Patrick Wolfe, 'Settler Colonialism and the Elimination of the Native', *Journal of Genocide Research* 8, no. 4 (December 2006), pp. 387–409, doi.org/10.1080/14623520601056240, and Yiftachel, Kedar and Amara, op. cit., p. 27 (in Hebrew).

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95. When, starting in the early 2000s, Palestinians – such as members of the village of al-Araqib located on one of Wadi Gaza's tributaries, and internally displaced – took matters into their own hands and returned to settle the land they inhabited for generations, the Israeli police demolished their village; since then, the village has been rebuilt more than 200 times, and destroyed the same number of times. See FA, 'Destruction and Return in al-Araqib', forensic-architecture.org/investigation/destruction-and-return-in-al-araqib.

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96. Ann Makayes, Tomer Bourlas and Zvi Efrat, *Studio Frontier: Documents and Analysis* (Bezalel Academy of Arts and Design, 2024, in Hebrew).

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97. Hayuta Zilberman (ed.), *Mara: Mordechai Galili, 1924–2012* (self-published, 2012), includes reprinted material from *Yahdav*, bulletin of kibbutz Nirim, p. 56.

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98. Ibid., pp. 56–7, 63.

BACK TO NOTE REFERENCE 98

99. Ibid., p. 61.

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100. Ibid., p. 63.

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101. Benny Morris, *Israel's Border Wars, 1949–1956: Arab Infiltration, Israeli Retaliation, and the Countdown to the Suez War* (Clarendon Press, 1993), p. 137.

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102. Zilberman (ed.), op. cit., p. 59.

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103. Jewish farmers were following a long tradition of settlers in colonies who likewise used farming to occupy and transform Indigenous landscapes, clear it from its native inhabitants and produce ecological transformation under the slogan of 'making the desert bloom'; William Cronon, *Changes in the Land: Indians, Colonists, and the Ecology of New England* (Hill and Wang, 2003); In late 1932 an American journalist reported from Libya under the headline of 'Will the Libyan Desert Bloom Again?'. The journalist wrote: 'The far-seeing eyes of Mussolini looked way beyond the wastelands that had been abandoned for more than a thousand years by all but fighting Arabs when he made a triumphal journey through the colony…the frontier of cultivation moved thirty-five miles from the coast… acreage of barley has been quadrupled, hundreds of thousands of new olive trees have been set out, bringing the total to about a million.' J.

R. W., ‘Will the Libyan Desert Bloom Again?’, *Milwaukee Journal*, 8 January 1932. See also ‘Making the Libyan Desert Bloom’, *Milwaukee Journal*, 20 December 1938.

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104. Regional Military Tribunal in Tzrifin, ‘The Continuation of the Discussion Concerning the Personnel of Nirim’, court file 18/50, 10 February, 1950.

BACK TO NOTE REFERENCE 104

105. Salman Abu Sitta wrote that they were ‘two brothers and their teenage sister’; Abu Sitta, *Mapping My Return*, op. cit., p. 116.

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106. Adania Shibli, *Minor Detail*, trans. Elisabeth Jaquette (New Directions, 2020).

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107. Regional Military Tribunal in Tzrifin, ‘The Continuation of the Discussion Concerning the Personnel of Nirim’, court file 18/50, 10 February, 1950.

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108. ‘Modus Vivendi to the Egyptian–Israeli General Armistice Agreement’ (S/1264/Rev.1), signed at el-Auja, 22 February, 1950; United Nations Security Council document S/1471, 17 March 1950.

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109. ‘Dayr Sunayd – Satellite View’, PalestineRemembered.com, n. d., palestineremembered.com/Gaza/Dayr-Sunayd/SatelliteView.html.

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110. Abu Sitta, *Atlas of Palestine*, op. cit., p. 114.

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111. Zilberman (ed.), op. cit., pp. 65–6.

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112. Dan Gazit, ‘What Truly Envelopes Gaza’, *Neemanegev*, issue 24 (14 June 2019), quoted in Amnon Dagieli, settler from Nirim. See source,

https://shimur.org/mpps/-%20%D7%A0%D7%90%D7%9E%D7%A0%D7%92%D7%91%D7%92%D7%99%D7%9C%D7%99%D7%95%D7%9F-%20%D7%9E%D7%A1%D7%A4%D7%A84/ and copy of the file, https://shimur.org/wp-content/uploads/2019/07/%D7%A0%D7%90%D7%9E%D7%A0%D7%92%D7%91-24-%D7%9E%D7%95%D7%A0%D7%92%D7%A9.pdf. See also Mordechai Galili, 'The Border Marking,' *Yahdav* [kibbutz Nirim bulletin], 31 July 1950, quoted in *Mara: Mordechai Galili*, memorial book published by kibbutz Nirim, probably 2013, pp. 65–8. See also *Yahdav*, Nirim bulletin.

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113. Abu Sitta, *Atlas of Palestine*, op. cit., p. 115.

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114. Eyal Weizman and Ines Weizman, *Before & After: The Architecture of Disaster* (Diaphanes, 2025).

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115. Zilberman (ed.), op. cit., p. 63.

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116. Ines Weizman, 'With Amos Gitai in Thuringia. Bauhäusler Munio Weinraub's Last Days in Germany', in Ines Weizman, *The Architectural Casino: Conversations about Colonial Modernism in Haifa* (Diaphanes, forthcoming, 2026). Published also in German: Ines Weizman, 'Mit Amos Gitai in Thüringen. Die letzten Tage des Bauhäuslers Munio Weinraub in Deutschland', in Franck Hofmann, Markus Messling and Christiane Solte-Gresser (eds), *Rhinozeros. Europa im Übergang 5. 'Lügen'* (2025), pp. 154–71.

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117. Sharon Rotbard, 'Wall and Tower', in Rafi Segal and Eyal Weizman (eds), *A Civilian Occupation: The Politics of Israeli Architecture* (Verso, 2003).

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118. Muki Tzur and Yuval Danieli (eds), *Mestechkin Builds Israel: Architecture in the Kibbutz* (Kibbuz Meuhad Publishing, 2008, in Hebrew); Zvi Efrat, *The Object of Zionism: The Architecture of Israel*

(Spector Books, 2018), pp. 312–13.

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119. Zilberman (ed.), op. cit., p. 63.

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120. *Ba-Kibbutz*, the weekly magazine of the kibbutz Ha'artzi, *al-Hamishmar*, 8 April 1951.

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121. Moshe Dayan, *Living with the Bible* (William Morrow, 1978).

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122. Albert Memmi, *The Colonizer and the Colonized* (Beacon Press, 1965).

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123. Aharon Cohen. In 1948, he became head of Mapam's 'Arab Department'. He was the author of 'Our Policy Towards Arabs during the War', a Mapam policy statement endorsed by their Political Committee and distributed to all party workers . See Avi Bareli, '*Mamlakhtiyut*, Capitalism and Socialism during the 1950s in Israel', *Journal of Israeli History: Politics, Society, Culture* 26, no. 2 (2007), pp. 201–27, doi.org/10.1080/13531040701552132.

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124. Amit Tubi and Eran Feitelson, 'Drought and Cooperation in a Conflict-Prone Area: Bedouin Herders and Jewish Farmers in Israel's Northern Negev, 1957–1963', *Political Geography* 51 (2016), pp. 30–42.

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125. Areej Sabbagh-Khoury, *Colonizing Palestine: The Zionist Left and the Making of the Palestinian Nakba* (Stanford University Press, 2023), p. 199; Areej Sabbagh-Khoury, 'Memory for Forgetfulness: Conceptualizing a Memory Practice of Settler Colonial Disavowal', *Theory and Society* 52, no. 2 (2023), pp. 263–92.

BACK TO NOTE REFERENCE 125

126. Zilberman (ed.), op. cit., p. 83.

BACK TO NOTE REFERENCE 126

127. Tubi and Feitelson, op. cit., p. 35; Members of Mapam undertook various actions to alleviate the situation of Palestinian Bedouins left in Israel. These included efforts to end the military administration, advance Bedouin land ownership claims and foil government attempts to further relocate Bedouin tribes.

BACK TO NOTE REFERENCE 127

128. Efrat, op. cit., pp. 12–14. The department was later moved to the Ministry of Interior and eventually evolved into the Ministry for Housing and Construction.

BACK TO NOTE REFERENCE 128

129. Ibid., fn 11, p. 72.

BACK TO NOTE REFERENCE 129

130. Ibid., p. 63

BACK TO NOTE REFERENCE 130

131. Efrat, op. cit. Efrat relies on E. Brutzkus, *The Rural Settlement and the Urban Settlement in the State of Israel* (*Journal of Environmental Planning 33*, 1985), p. 57.

BACK TO NOTE REFERENCE 131

132. Efrat, op. cit., p. 65.

BACK TO NOTE REFERENCE 132

133. Temper, op. cit. Other expropriation mechanisms included the Emergency Land Requisition Law which authorised expropriation ‘for the defence of the state, public security and the absorption of immigrants’; a law enabling the minister of agriculture to take control of ‘waste’ (uncultivated) land and further laws that in 1952 and 1953 granted the World Zionist Agency, the Jewish Agency for the Land of Israel and the Israel National Fund, control over the land. Given that these organisations were registered abroad and purported to take action of behalf of the Jewish people, transferring land to their management was thus transferring it effectively to the world Jewish custody.

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134. David Ben-Gurion, ‘Achievements and Tasks’, in *Like Stars and Dust: Essays from Israel’s Government Year Book* (Sde-Boqer: The Ben-Gurion Heritage Institute, 1954), p. 354.

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135. Efrat, op. cit., pp. 92–7.

BACK TO NOTE REFERENCE 135

136. Arieh Sharon, *Physical Planning in Israel* (The Government Printer, 1951) (in Hebrew). The plan meant for the development towns ‘to facilitate the lives of industry workers, furnishing them with comfortable and inexpensive public housing, convenient transportation to their workplaces and to parklands for recreation’.

BACK TO NOTE REFERENCE 136

137. Smadar Sharon, *This is How One Occupied a Homeland: The Planning and Settlement of the Lahish District in the 1950s* (Pardes, 2017), p. 197 (in Hebrew). The distinctions between the moshav and kibbutz types were blurred since the 1990s, due to the economic crisis affecting the moshav and kibbutz movements and due to changes in the prevailing values of Israeli society. Since the 1980s many of these settlements have branched out into industry and tourism, while some of their members have begun to work as salaried employees in the adjacent urban centres. See Yehezkel Lein, in collaboration with Eyal Weizman, ‘Land Grab: Israel’s Settlement Policy in the West Bank’, B’Tselem, May 2002, btselem.org/download/200205_land_grab_eng.pdf.

BACK TO NOTE REFERENCE 137

138. Sharon Rotbard, *White City, Black City: Architecture and War in Tel Aviv and Jaffa* (Pluto Press, 2015), p. 197; Tom Avermaete, Serhat Karakayali and Marion von Osten (eds), *Colonial Modern: Aesthetics of the Past, Rebellions for the Future* (Black Dog Publishing, 2010), p. 197.

BACK TO NOTE REFERENCE 138

139. Gertrude Samuels, ‘First Line of Defense for Israel’, *New York Times*, 25 January 1959.

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140. Minutes of the Eighth Session of the Israeli Government, 20 October

1953, Israel State Archive.

BACK TO NOTE REFERENCE 140

141. Smadar Sharon, op. cit., pp. 19, 93, 113.

BACK TO NOTE REFERENCE 141

142. Shukri Arraf, *Almawaqi al-jughrafiyah fi Filastin: al-asma' al-'arabiyah wa-al-tasmiyat al-'ibriyah* ('Geographic Sites in Palestine: Arabic Names and Hebrew Denominations') (Institute for Palestine Studies, 2004), p. 302. The Nahal was a direct institutional continuation of Zionist settlement practices which had been developed in the 1920s and 30s, long before the 1948 war, the expulsion of the majority of the Palestinian population, and the establishment of the Israeli state.

BACK TO NOTE REFERENCE 142

143. Yigal Allon, *Curtain of Sand* (Hakibbutz Hameuchad, 1988 [1959]), pp. 52, 61–82, 366–7 (in Hebrew).

BACK TO NOTE REFERENCE 143

144. Ibid., p. 244.

BACK TO NOTE REFERENCE 144

145. Between July and December 1976 Harsina gave a series of interviews to the Oral History Department of the Center for International Study of the Hebrew University in Jerusalem. In 1979 an Israeli settlement near Hebron was named after Harsina before he passed. The State of Israel, Ministerial offices, Aharon Harsina, personal interviews, 1–5 and 12 July 1976, archived on 14 December 1976 in the Oral History Department of the Center for International Study of the Hebrew University in Jerusalem. See also Smadar Sharon, op. cit., p. 73.

BACK TO NOTE REFERENCE 145

146. 'Israel Inaugurates Yarkon–Negev Pipeline Amid Great Festivities', Jewish Telegraphic Agency, 20 July 1955, jta.org/1955/07/20/archive/israel-inaugurates-yarkon-negev-pipeline-amid-great-festivities.

BACK TO NOTE REFERENCE 146

147. Harsina, op. cit., personal interviews, 2–3 August 1976.

BACK TO NOTE REFERENCE 147

148. Yoram Fried, *From Security Settlements to Securing the Settlements: The IDF's Settlement Policy, 1949–1967* (my translation from Hebrew) (Resling, 2020), pp. 55–66.

BACK TO NOTE REFERENCE 148

149. S. Ilan Troen, *Imagining Zion: Dreams, Designs, and Realities in a Century of Jewish Settlement* (Yale University Press, 2003), p. 67.

BACK TO NOTE REFERENCE 149

150. Settlement Department of the Jewish Agency, 'Security Principles for the Planning of Agricultural Settlements and Workers' Villages', 21 May 1951, and 'Security Orders for the Planning of Agricultural Settlements', 10 July 1951; Harsina, op. cit., personal interview, 3 August 1976.

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151. The issue of settlements was debated by the army general staff on 25 February, 1949 (at the same time that the borders were negotiated in Rhodes). Smadar Sharon, op. cit.

BACK TO NOTE REFERENCE 151

152. Smadar Sharon, op. cit., p. 72.

BACK TO NOTE REFERENCE 152

153. Harsina, op. cit., personal interview, 3 August 1976.

BACK TO NOTE REFERENCE 153

154. Smadar Sharon, op. cit., pp. 114, 116.

BACK TO NOTE REFERENCE 154

155. Settlement Department of the Jewish Agency, 'Security Principles for the Planning of Agricultural Settlements and Workers' Villages', 21 May 1951, and 'Security Orders for the Planning of Agricultural Settlements', 10 July 1951, p. 187.

BACK TO NOTE REFERENCE 155

156. Morris, *Israel's Border Wars*, op. cit., pp. 28, 133. This number gradually decreased, reaching about 4,500 'infiltrations' in 1955.

BACK TO NOTE REFERENCE 156

157. Ibid., p. 132. The mining by the kibbutzim was suspended only after Jews had accidentally been injured or killed.

BACK TO NOTE REFERENCE 157

158. Ibid., p. 149.

BACK TO NOTE REFERENCE 158

159. Abu Sitta, *Mapping My Return*, op. cit., p. 118. In 1953 Abdullah convened the first conference for the refugees in Gaza. Their claim was 'we want to return home. We do not want your [UN] food and shelter.' He was elected to the first legislative council in Gaza in 1961, representing Palestine in non-aligned conferences.

BACK TO NOTE REFERENCE 159

160. Ibid., pp. 110–11.

BACK TO NOTE REFERENCE 160

161. Hussein Abu al-Naml, *The Gaza Strip, 1948–1967: Economic, Political, Social, and Military Developments* (in Arabic) (Palestine Research Center, 1979).

BACK TO NOTE REFERENCE 161

162. Nur Masalha, *Expulsion of the Palestinians: The Concept of 'Transfer' in Zionist Political Thought, 1882–1948* (Institute for Palestine Studies, 1992).

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163. 'The March 1955 Outburst in the Gaza Strip: Thwarting Resettlement Schemes', *Interactive Encyclopedia of the Palestine Question*, palquest.org/en/overallchronology?synopses%5B0%5D=21228&nid=21228.

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164. Jonathan Adler, 'How Plans to Move Palestinians to Egypt Backfired', *New Lines Magazine*, 12 May 2023, newlinesmag.com/essays/how-plans-to-move-palestinians-to-egypt-backfired/.

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165. 'Survey Report, Northwest Sinai Project, Republic of Egypt, Prepared by the United Nations Relief and Works Agency for Palestine

Refugees in the Near East and the Permanent Council for the Development of National Production of the Republic of Egypt', Cairo, 28 July 1955, un.org/unispal/document/auto-insert-195116/.

BACK TO NOTE REFERENCE 165

166. Abu Sitta, *Mapping My Return*, op. cit., p. 112.

BACK TO NOTE REFERENCE 166

167. Kobi Aviezer, *Chapters of a Life Story* (Nirim, 2025), p. 19, nirim.co.il/uploads/הנצחה/kobiAviezer.pdf [inactive] (in Hebrew).

BACK TO NOTE REFERENCE 167

168. See Samia Henni, *Architecture of Counterrevolution: The French Army in Northern Algeria* (gta Verlag, 2017).

BACK TO NOTE REFERENCE 168

169. The names of two of the assailants are known because they were caught a few months later, sentenced for life, and released in a prisoner-exchange deal.

BACK TO NOTE REFERENCE 169

170. Elias Khoury, 'In Front of the Gates of Gaza', *Journal of Palestine Studies*, no. 115 (2018), pp. 5–9.

BACK TO NOTE REFERENCE 170

171. Vladimir Jabotinsky, 'The Iron Wall (Us and the Arabs)', *Razsviet*, 4 November 1923, translated by the Jabotinsky Institute, en.jabotinsky.org/media/9747/the-iron-wall.pdf.

BACK TO NOTE REFERENCE 171

172. Khoury, op. cit.

BACK TO NOTE REFERENCE 172

173. See Yezid Sayigh, *Armed Struggle and the Search for State: The Palestinian National Movement, 1949–1993* (Clarendon Press, 1997), p. 65; Benny Morris, *Righteous Victims: A History of the Zionist-Arab Conflict, 1881–2001* (Random House, 2011), p. 295; Morris, *Israel's Border Wars*, op. cit., p. 424.

BACK TO NOTE REFERENCE 173

174. Alon Tal, ‘Seeking Sustainability: Israel’s Evolving Water Management Strategy’, *Science* 313, no. 5790 (2006), pp. 1081–4; Alon Tal, *Pollution in a Promised Land: An Environmental History of Israel* (University of California Press, 2002); Alon Tal, ‘Space Matters: Historic Drivers and Turning Points in Israel’s Open Space Protection Policy’, *Israel Studies* 13, no. 1 (2008), pp. 119–51; Alon Tal, ‘To Make a Desert Bloom: The Israeli Agricultural Adventure and the Quest for Sustainability’, *Agricultural History* 81, no. 2 (2007), pp. 228–57; Daniel E. Orenstein, Alon Tal and Char Miller (eds), *Between Ruin and Restoration: An Environmental History of Israel* (University of Pittsburgh Press, 2013), pp. 146–68.

BACK TO NOTE REFERENCE 174

175. Smadar Sharon, op. cit., p. 112.

BACK TO NOTE REFERENCE 175

176. Ibid., p. 125.

BACK TO NOTE REFERENCE 176

177. Michael Beyth, ‘A Brief History of the Geological Survey of Israel’, *International Geology Review* 65 (2023), pp. 969–78, gov.il/BlobFolder/aboutoffice/aboutt/en/GSI%20History.pdf.

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178. J. W. Erisman, M. A. Sutton, J. Galloway, Z. Klimont and W. Winiwarter, ‘How a Century of Ammonia Synthesis Changed the World’, *Nature Geoscience* 1 (October 2008), pp. 636–9, doi.org/10.1038/ngeo325.

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179. Philip McMichael, ‘A Food Regime Genealogy’, *Journal of Peasant Studies* 36, no. 1 (2009), pp. 139–69 , doi.org/10.1080/03066150902820354; Philip McMichael, *Food Regimes and Agrarian Questions* (Fernwood Publishing and Practical Action Publishing, 2013).

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180. Research supported by the Israeli Ministry of Science and Technology undertaken in the wake of 7 October – the study seeks to identify crops whose production is affected due to the Israel-Hamas War and

the deleterious effect on Israel's local food production.

BACK TO NOTE REFERENCE 180

181. Eyal Hareuveni (ed.), Yael Stein, *B'Tselem Report*, trans. Zvi Shulman, July 2010. In April 2023 the government extended the following designated budget for the Gaza Envelope for the years 2023–4: 20 per cent discount on income tax, 45 per cent discount on 'council tax'. Beyond these a further 830 million shekels for infrastructure, and improvement of public spaces, 190 million for 'growth engines', 220 million for development and strengthening of the local economy, 70 million for emergency prep and 100 million for reinforcing the personal and communal security. 'Israeli Government Extends Budget for Gaza Envelope, Including Tax Discounts and Infrastructure Funding', *Bizportal*, April 2023, (in Hebrew) bizportal.co.il/general/news/article/813762#.

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182. Matan Kaminer, *Capitalist Colonial: Thai Migrant Workers in Israeli Agriculture* (Stanford University Press, 2024).

BACK TO NOTE REFERENCE 182

183. Abd Rabou et al., op. cit.

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184. Arab Reporters for Investigative Journalism (ARIJ), 'Gaza's Valley of Slow Death', 30 June 2012, en.arij.net/investigation/gazas-valley-of-slow-death/; Samples from its water and soil, analysed at the labs of the Water and Soil Institute of al-Azhar University in Gaza, indicated an extremely high level of faecal coliforms and organic matter.

BACK TO NOTE REFERENCE 184

185. Ibid.

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Part II

1. Yahya al-Sinwar, *The Thorn and the Carnation* (TASQ Company, 2004), Chapter 1 (in Arabic). The book was smuggled out in sections from Israeli prisons, where al-Sinwar was serving four life sentences.

BACK TO NOTE REFERENCE 1

2. In the nineteenth-century literature, ‘underground’ became a place of survival. See writers like Victor Hugo, Jules Verne, H. G. Wells, Gabriel Tarde and, in the early twentieth century, E. M. Forster.

BACK TO NOTE REFERENCE 2

3. Aref al-Aref, *Ghazza ‘Abr al-Tarikh* (*Gaza Through History*) (Maktabat al-Muthanna, 1943), p. 281.

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4. Ibid., p. 68; Ilana Feldman, *Governing Gaza: Bureaucracy, Authority, and the Work of Rule, 1917–1967* (Duke University Press, 2008), pp. 162–4.

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5. Mustafa Murad al-Dabbagh, *Biladuna Filastin* (Encyclopedia: Palestine, Our Homeland), vol. 2: *The Gaza Region* (Institute for Palestine Studies, 2018, in Arabic).

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6. Abaher El-Sakka, *Gaza: A Social History under British Colonial Rule, 1917–1948* (Institute for Palestine Studies, 2018), pp. 280, 295 (in Arabic). El-Sakka cites William McClure Thomson, *The Land and the Book: The Holy Land* (Thomas Nelson, 1911), p. 549.

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7. Abed al-Karim al Samouni, ‘Sewage Well Drilling: “The First Mistake Is the Last” ’, Ultra Palestine, 16 December, 2019, https://ultrapal.ultrasawt.com/%D8%AD%D9%81%D8%B1-%D8%A2%D8%A8%D8%A7%D8%B1-%D8%A7%D9%84%D8%B5%D8%B1%D9%81-%D8%A7%D9%84%D8%B5%D8%AD%D9%8A-%D8%A7%D9%84%D8%AE%D8%B7%D8%A3-%D8%A7%D9%84%D8%A3%D9%88%D9%84-%D9%87%D9%88-%D8%A7%D9%84%D8%A3%D8%AE%D9%8A%D8%B1/%D8%B9%D8%A8%D8%AF-%D8%A7%D9%84%D9%83%D8%B1%D9%8A%D9%85-%D8%A7%D9%84%D8%B3%D9%85%D9%88%D9%86%D9%8A/%D8%AA%D9%82%D8%A7%D8%B1%D9%8A%D8%B1/%D8%A3%D8%AE%D8%A8%D8%A7.

BACK TO NOTE REFERENCE 7

8. Ibid.

BACK TO NOTE REFERENCE 8

9. Buildings in the camps near Wadi Gaza were expanded using the extracted clay. Mohammed AbuJayyab, who was born in al-Maghazi, told me that some buildings in the camp used to be made of a mixture of subterranean clay with straw, lime and sand.

BACK TO NOTE REFERENCE 9

10. Ibn Waḥshīyah, *Al-Filāḥah al-Nabaṭīyah* (Nabataean Agriculture), trans. Toufic Fahd (Institut Français de Damas, 3rd edn, 1993–8), Chapters 3–10. The work discusses irrigation techniques, water procurement and quality, well construction, and ancient soil analysis practices based on texture, smell and taste.

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11. Joel Roskin, 'The Development of Underground Activity and Guerrilla Warfare in the Gaza Strip and the Complexities of Combatting It', in Eitan Klein, Avraham Sasson and Ayelet Levy-Reifer (eds), *Ashkelon and Its Environs: A Collection of Studies on the Southern Coastal Plain and the Judean Plain* (Ashkelon Academic College and Restling, 2020).

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12. Quoted in 'Ghassan Kanafani and the Tent of Resistance: Heralding Victory and Return', Masar Badil, 12 July 2023, masarbadil.org/en/2023/07/4110/.

BACK TO NOTE REFERENCE 12

13. Omri Shafer Raviv, *Landlords: The Israeli Government and the Palestinians, 1967–1969* (Makhon Ben Guryon, 2025), pp. 190–201 (in Hebrew).

BACK TO NOTE REFERENCE 13

14. Guevara's visit to al-Bureij refugee camp was part of the process by which Palestine shifted from a regional question to the symbol of a global struggle against colonialism. Other notable guests followed. Jawaharlal Nehru entered Gaza in May 1960 to meet Indian UN troops and visit refugee camps; in 1964 Malcolm X had a two-day

sojourn to Gaza visiting the Khan Younis refugee camp. Widad al-Aswad was deported to Jordan in 1974, and was active in the PFLP. She returned to Palestine in 1994. See 'Obituary of the Historic Activist Widad Musleh Al-Aswad', Qudsnet, 14 February, 2023, https://qudsnet.com/post/548076/%D9%86%D8%B9%D9%8A-%D8%A7%D9%84%D9%85%D9%86%D8%A7%D8%B6%D9%84%D8%A9-%D8%A7%D9%84%D8%AA%D8%A7%D8%B1%D9%8A%D8%AE%D9%8A-%D8%A9-%D9%88%D8%AF%D8%A7%D8%AF-%D9%85%D8%B5%D9%84%D8%AD-%D8%A7%D9%84%D8%A3%D8%B3%D9%88%D8%AF.

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15. 'Gaza Tunnels: The Great Resistance Innovation', Palestinian Information Center, 17 August 2008, palinfo.com/news/2008/08/17/179712/ (in Arabic); *Portrait: 'Gaza's Che Guevara'…The Resistance Spectre That Haunted Israeli Intelligence*, Al Jazeera documentary, updated 9 October 2023, https://www.aljazeera.net/doc/2009/6/15/%d8%ac%d9%8a%d9%81%d8%a7%d8%b1%d8%a7-%d9%8a%d8%b9%d9%88%d8%af-%d8%a5%d9%84%d9%89-%d8%ba%d8%b2%d8%a9-%d8%a8%d8%b9%d8%af-36-%d8%b9%d8%a7%d9%85-%d9%85%d9%86-%d8%a7%d9%84%d8%ba%d9%8a%d8%a7%d8%a8 (in Arabic); Hamzah Baig, 'Spirit in Opposition: Malcolm X and the Question of Palestine', *Social Text* 37, no. 3 (1 September 2019), pp. 47–71; Salman Abu Sitta, 'Che Guevara in Gaza: Palestine Becomes a Global Cause', Palestine Land Society, August 2015, plands.org/en/articles-speeches/articles/2015/che-guevara-in-gaza-palestine.

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16. Hashim S. H. Behbehani, *China's Foreign Policy in the Arab World, 1955–75: Three Case Studies* (Kegan Paul International, 1981); A. R. Takriti, *Monsoon Revolution: Republicans, Sultans, and Empires in Oman, 1965–1976* (Oxford University Press, 2013).

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17. C. L. Sulzberger, 'The Secret Recesses', *New York Times*, 7 November 1973.

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18. 'Dig tunnels deep, store grain everywhere and never seek

hegemony…Be prepared against war, be prepared against natural disasters and do everything for the people.'

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19. K. R. Olson and L. W. Morton, 'Why Were the Soil Tunnels of Cu Chi and Iron Triangle in Vietnam So Resilient?', *Open Journal of Soil Science* 7, no. 2 (February 2017), pp. 34–54, doi.org/10.4236/ojss.2017.72003.

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20. His units have also targeted Palestinians suspected of collaborating with the Israeli army, and have likely been the ones that assassinated Catholic priest Yohana Nimri after Israel tried to install him as mayor of Gaza City. They also attempted the assassination of former mayor Rashed al-Shawa. *Davar*, 1 March 1973 (in Hebrew).

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21. Alessandro Petti, Sandi Hilal and Eyal Weizman, *Architecture After Revolution* (Sternberg Press, 2013), pp. 49–50.

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22. Al-Arabi Akhbar, 'Guevara Gaza: The Full Story of a Palestinian Hero Who Fought the Occupation Bravely', YouTube video, 2 July 2022, youtu.be/WQ2tnGVJrMs (in Arabic).

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23. Wisam Rafeedie, *The Trinity of Fundamentals*, trans. Dr Muhammad Tutunji (1804), *Books and the Palestinian Youth Movement*, 2024. 'I escape from wall to wall,' wrote Ahmad Qatamesh in his preface to this book to capture something of the architectural nature of the endeavour. The quote is from Syrian poet Nizar Qabbani.

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24. Muhammad al-Aswad, 'Gaza's Guevara Who Haunted Moshe Dayan', YouTube video, 28 March 2018, youtube.com/watch?v=2evw8c-ig1I [inactive] (in Arabic).

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25. '104 Terrorists Killed This Year in the Gaza Strip, Hunt for Guevara, Commander of the Front', *Davar*, 3 January 1972(in Hebrew).

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26. David Maimon, *Terror Defeated: The Suppression of Terror in the Gaza Strip, 1971–1972* (Stematski, 1993) (in Hebrew).

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27. Ibid., p. 41.

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28. 'Let's Talk About Gaza: Pottery in Gaza', Rosa Luxemburg Foundation, June 2017, rosalux.ps/wp-content/uploads/2017/06/Lets-Talk-About-Gaza.-Pottery-in-Gaza.pdf.

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29. IDF archive 7.4.1971-1.5.1971 file number: 44-1983/1999 stamp: 6071085, AD 28; restricted/command area 64/ commander headquarters 23 November 1971/ concerning: tiles of encounters, discovery of bunkers and armed phenomena in the Strip. The document details the unfolding of the operation. The army declared a curfew and engaged in divergent raids in another part of the camp. In the meantime the soldiers set an ambush outside the house that harboured the tunnel. Four Palestinian fighters, realising they were surrounded, tried to break a hole through the external wall of the house, but were gunned down by soldiers.

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30. Shafer Raviv, *Landlords*, op. cit., pp. 190–201.

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31. Ofer Aderet, 'Israeli Prime Minister After Six-Day War: "We'll Deprive Gaza of Water, and the Arabs Will Leave"', *Haaretz*, 17 November 2017, haaretz.com/israel-news/2017-11-17/ty-article/.premium/israeli-pm-in-67-well-deprive-gaza-of-water-and-the-arabs-will-leave/0000017f-e8df-da9b-a1ff-ecff5b720000.

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32. Shafer Raviv, *Landlords*, op. cit., pp. 185–6; Hadeel Assali, 'Palestinians in Paraguay', *London Review of Books*, 18 May 2023, lrb.co.uk/the-paper/v45/n10/hadeel-assali/diary; Omri Shafer Raviv, 'רוצה אני לקוות שיסתלקו', *Hazman Hazeh*, January 2023,

hazmanhazeh.org.il/emigration_encouragement/, January 2023 (in Hebrew).

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33. Fatina Abreek-Zubiedat, *A Territory in Conflict: Eras of Development and Urban Architecture in Gaza* (University of Pittsburgh Press, 2025). Some thought the West Bank was the best destination for the refugees of Gaza. Moshe Safdie, who, as a young architect in 1963, proposed a city near Cairo to house 150,000 Palestinian refugees in a series of pyramidal structures, suggested building a city for refugees between Ramallah and Nablus. Moshe Safdie, *If Walls Could Speak: My Life in Architecture* (Grove Press, 2022), pp. 60–61.

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34. Ofer Aderet, ‘ “We Give Them 48 Hours to Leave”: Israel’s Plans to Transfer Gazans Go Back 60 Years’, *Haaretz*, 5 December 2024, haaretz.com/israel-news/2024-12-05/ty-article-magazine/.premium/we-give-them-48-hours-to-leave-israels-plans-to-transfer-gazans-go-back-60-years/00000193-9716-dac2-add3-b75e12d30000.

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35. The meeting of the Planning Department to decide on the establishment of Netzarim took place on June 1970, and, typical of such meetings, it was almost two months after construction already began, and recorded some debate. Some members warned that the plan generated unreasonable risk for placing ‘100–200 people inside a pressure cooker of 300,000 Arabs’. Shlomo Gazit, ‘The function is political and psychological,’ he continued. ‘We have claimed for three years that Gaza won’t return to Egyptian control. Facts on the ground will convince the Egyptians that Israel would not withdraw from Gaza again.’ The rest of the discussion turned to soil, the value of the clay dredged by the Wadi Gaza and how to protect it from mixing with sand. Protocol of the Meeting of the Settlement Committee, 2 June 1970, 306-6-Alef, April 1972.

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36. Ariel Sharon and David Chanoff, *Warrior: The Autobiography of Ariel Sharon* (Simon & Schuster, 2001), p. 259.

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37. Protocol of the Meeting of the Settlement Committee, 2 June 1970, 306-6-Alef, April 1972; Anshel Pfeffer, 'Sharon Ordered Expulsion of 3,000 Bedouin, New Biography Reveals', *Haaretz*, 12 February, 2014, haaretz.com/2014-02-12/ty-article/.premium/sharon-expelled-3-000-bedouin/0000017f-efcd-d8a1-a5ff-ffcff2a50000; Idan Landau, 'The Expulsion from Rafah Development and the Zionist Doctrine of Unknowing', Idan Landau's blog, 26 January 2017, idanlandau.com/2017/01/26/rafah-expulsion-and-zionist-doctrine-of-unknowing/ (in Hebrew).

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145. Similar patterns were made explicit when Argentina 'conquered the desert', Brazil 'occupied the Amazon', Australians took over Tasmania, and when German troops expelled Indigenous peoples from arable land in South West Africa. See Gurmendi Dunkelberg, op. cit.

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265. The designed destruction of towns and villages across the colonial world (and often of poor neighbourhoods across Europe's metropolitan centres) always sought to produce a layout of optimal control and subdue resistance, revolutions and barricades. Marshal Thomas Bugeaud, *La guerre des rues et des maisons* (J.-P. Rocher, 1997), especially Chapter 3. Bugeaud was the general who exercised the destruction of Algiers in the 1840s. Shortly after his return to France in 1849 (following his failure to quickly suppress the 1848 events) he published this book which suggested, based on his colonial experience, that state control of unruly Paris could be achieved by the carving of straight and wide boulevards through the dense, poor and rebellious neighbourhoods of Paris. In the text, Bugeaud proposed widening Parisian streets and removing corner buildings at strategic crossroads to improve visibility. The principle was later implemented by one of his most avid readers, the planner of modern Paris, Baron Haussmann. See Sharon Rotbard, *White City, Black City: Architecture and War in Tel Aviv and Jaffa* (Pluto Press, 2015) and Sharon Rotbard, *The War of Streets and Homes: And Other Texts on the City* (Babel, 2021).

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266. Plans for the so-called 'day after' were made by others. Tony Blair through his Institute for Global Change sought to rally international support around his proposal to establish an international body to govern the Gaza Strip until it can be handed over to the Palestinian Authority. The plan also proposes the temporary relocation of Palestinians elsewhere though promises to retain property ownership. See Jacob Magid, 'Revealed: Tony Blair's US-Backed Proposal for Ending the Gaza War and Replacing Hamas', *The Times of Israel*, 18 September 2025, timesofisrael.com/revealed-tony-blairs-us-backed-proposal-for-ending-the-gaza-war-and-replacing-hamas/.

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267. Lemkin, *Axis Rule*, op. cit., pp. 79, 26–7.

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268. Union of Municipalities of Gaza, 'Gaza Phoenix: A Framework for the Reconstruction of Gaza Strip', 2025, gsmuns.org/pdf/english_abstract.pdf.

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About the Author

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Appendix: Image Description

The following image in this ebook illustrates complex ideas or contains a passage of text. Here it has been reproduced as a thumbnail and accompanied by an extended description.

Wells and water holes
Tent clusters
Tent clusters
Tent clusters

Near the bottom edge, slightly left of centre, a horizontal scale bar is labeled “0” at the left end and “500 m” at the right end, indicating a distance of 500 meters.

Central area and annotations

The central area of the map is densely annotated. At the very centre, a label reads “centre al-Ma‘in.” Around this label, several small white circles with short radiating lines mark “wells and water holes,” indicated by the text “wells and water holes” slightly to the right of the centre. Just below and slightly left of the centre, another label reads “main well,” placed next to a cluster of white circles. Around the central crossroads, numerous small yellow rectangles and irregular shapes represent “tents” and hard structures. The word “tents” appears just above and slightly left of the centre, next to a cluster of these yellow shapes.

Family orchards and houses around the centre

- Just below the centre, slightly to the left, a label reads “Abu Ibreisha’s house.” A small yellow rectangle marks the house within a field segment.
- Below and slightly right of the centre, a label reads “Suleiman orchard.” This orchard is indicated by a rectangular block filled with a grid of small yellow dots, representing trees, adjacent to yellow rectangles that mark structures.
- Directly below the centre, another label reads “Nasrallah orchard,” also marked by a block of yellow dots within a field segment.
- Further down toward the bottom edge, near the lower centre, a label reads “Abd al-Aziz orchard.” This orchard is shown as a rectangular area filled with yellow dots, with a few yellow rectangles nearby. The word “trees” appears near this orchard, with an arrow pointing toward scattered yellow dots in the surrounding fields.

Upper left quadrant and nearby features

- Near the upper left edge, a label reads “Mohammad Mustapha orchard.” This orchard is represented by a rectangular block of yellow dots within a larger field area.
- Below this, closer to the centre but still in the left half, a label reads “Hamad Hussein orchard,” marking another orchard area with yellow dots.
- Near the left edge, a diagonal label reads “Khan Younis,” with an arrow pointing off the map toward that direction.
- In the same general left-side area, the word “trees” appears with an arrow pointing toward scattered yellow dots that are not in a dense grid, indicating individual or less formally planted trees.
- Slightly left of centre, a large field area is labeled “cereal field,” spanning several of the wedge-shaped segments.

Upper central and upper right portions

- Above the centre, slightly to the right, a label reads “school.” A small yellow building-like shape marks the school’s location near the central crossroads.
- Above the centre, slightly to the left, a label reads “house,” next to a small yellow rectangle.
- In the upper central area, a label reads “Sheikh Hussein orchard,” marking a block of yellow dots within a field.
- To the right of that, in the upper right quadrant, a label reads “Mohammad Suleiman orchard,” again shown as a rectangular grid of yellow dots. Nearby, a few yellow rectangles indicate associated structures.
- In the far upper right, the terrain becomes more rugged, with irregular, branching depressions or channels. Along this area, the word “grazing” appears, indicating land used for grazing animals. A “well” label appears near a small white circle in this region.

Right half of the map

- Roughly mid-right, a label reads “well” next to a white circle, marking another water source.
- Below and slightly right of centre, a label reads “Hamoud Safar

orchard," marking a block of yellow dots within the radial field pattern.
- Near the lower right edge, a label reads "Hamad Hamad orchard," again indicated by a dense grid of yellow dots. The word "trees" appears nearby with an arrow pointing toward additional scattered yellow dots.
- Along the right edge, a diagonal label reads "Beersheba," with an arrow pointing off the map in that direction.

Lower left quadrant and bottom edge

- Near the lower left edge, a diagonal label reads "Rafah," with an arrow pointing off the map.
- Slightly above this, within the radial fields, a label "well" appears next to a white circle.
- In several lower-left and lower-central fields, the word "trees" appears with arrows pointing toward scattered yellow dots, indicating individual or small clusters of trees outside the main orchards.

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